

Department of the Army  
Pamphlet 385-24

Safety

# **The Army Radiation Safety Program**

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Department of the Army  
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**UNCLASSIFIED**

# ***SUMMARY of CHANGE***

DA PAM 385-24

The Army Radiation Safety Program

This new Department of the Army pamphlet, dated 24 August 2007--

- o Clarifies functions of organizations that support the Radiation Safety Program (para 1-4).
- o Clarifies the use of safety councils and committees (paras 1-6, 1-7, 1-8, and 1-9).
- o Adds the Nuclear Regulatory Commission licenses, Army radiation authorizations, and Army radiation permit requirements (paras 2-2, 2-3, and 2-4).
- o Gives guidance on radioactive waste disposal (para 2-7).
- o Provides instruction on Personnel Security Screening Systems (para 2-9).
- o Provides requirements for light amplification by stimulated emission of radiation devices for tactical outdoor training and military exempt light amplification by stimulated emission of radiation devices (chap 3).
- o Clarifies compliance guidance for radio frequency safety programs (chap 4).
- o Defines personnel radiation, occupational ionizing radiation exposure standards, and dosimetry usage and recording (para 5-1 and table 5-1).
- o Gives guidance on radioactive contamination (para 5-2 and table 5-2).
- o Provides compliance for non-ionizing radiation (para 5-3 and table 5-3).
- o Clarifies special reporting requirements for radiation accidents, incidents, and overexposures (chap 6).
- o Provides training requirements for radiation safety officers, light amplification by stimulated emission of radiation safety officers, and radio frequency safety officers (chap 7).

Safety


The Army Radiation Safety Program

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By Order of the Secretary of the Army:

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Official:

  
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**History.** This publication is a new Department of the Army pamphlet.

**Summary.** This pamphlet establishes Army radiation safety guidance and direction. It provides guidance and direction to implement the safety requirements of AR 385–10 and other Federal regulations and laws. It provides guidance and direction to implement DODI 6055.8 and DODI 6055.11. It includes Army guidance for the use, licensing, disposal, transportation, dosimetry, accident reporting, safety design, and accountability of and radiation exposure standards for ionizing and non-ionizing radiation sources. This pamphlet provides updated guidance and direction to be consistent with current Federal radiation safety regulations; simplifies Army radiation authorization, Army radiation permit, and Nuclear Regulatory Commission license application procedures; requires Army radiation authorizations for

the use of machine-produced ionizing radiation; and strengthens Army Headquarters and installation radiation safety authority. This pamphlet aligns with the transformation of installation management by establishing Installation Management Command authority over many of the installation radiation safety programs. This pamphlet addresses peacetime, deployment, redeployment, and wartime radiation safety activities. This pamphlet does not apply to nuclear weapons surety (AR 50–5). Active Army, Army National Guard/Army National Guard of the United States, and U.S. Army Reserve personnel who violate this pamphlet are subject to punishment under the Uniform Code of Military Justice. Civilian and contractors are subject to applicable civil or criminal statutes.

**Applicability.** This pamphlet applies to the Active Army, the Army National Guard/Army National Guard of the United States, and the U.S. Army Reserve unless otherwise stated. It also applies to all active duty Army military personnel at any time, on or off a DOD installation; all Army civilian personnel in a duty status; on or off a DOD installation; all Army contractors; and all persons at any time on an Army installation.

**Proponent and exception authority.** The proponent of this pamphlet is the Chief of Staff, Army. The proponent has the authority to approve exceptions to this pamphlet that are consistent with controlling law and regulations. The proponent may delegate this approval authority, in

writing, to a division chief within the proponent agency or its direct reporting unit or filed operating agency, in the grade of colonel or the civilian equivalent. Activities may request a waiver to this pamphlet by providing justification that includes a full analysis of the expected benefits and must include formal review by the activity's senior legal officer. All waiver requests will be endorsed by the commander or senior leader of the requesting activity and forwarded through their higher headquarters to the policy proponent. Refer to AR 25–30 for specific guidance.

**Suggested improvements.** Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to the Director of Army Safety, ATTN: DACS–SF, 223 23rd Street, Room 980, Arlington, VA 22202.

**Distribution.** This publication is available in electronic media only and is intended for command levels C and D for Active Army, the Army National Guard/Army National Guard of the United States, and the U.S. Army Reserve.

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## **Chapter 1**

### **Introduction**

#### **1-1. Purpose**

This pamphlet establishes procedures and guidance for the safe use, storage, licensing, disposal, transportation, safety design, and inventory control of ionizing and non-ionizing radiation sources. It also provides radiation exposure standards and dosimetry and accident reporting instructions. Its objective is to ensure safe use of radiation sources and compliance with all applicable Federal and Department of Defense (DOD) rules and regulations. AR 385-10, chapter 7, describes the Department of the Army (DA) safety policy and processes for the Army radiation safety function.

#### **1-2. References**

Required and related publications and prescribed and referenced forms are listed in appendix A.

#### **1-3. Explanation of terms**

Abbreviations and special terms used in this pamphlet are defined in the glossary.

#### **1-4. Functions**

Based upon the responsibilities as defined in AR 385-10, the following organizations support radiation safety by providing the following functions:

- a.* The Assistant Secretary of the Army (Installations and Environment) (ASA(I&E))—
  - (1) Establishes overall Army environment, safety, and occupational health policy.
  - (2) Maintains general oversight of, and serves as advocate for, the Army Radiation Safety Program.
- b.* The Assistant Secretary of the Army (Manpower and Reserve Affairs) (ASA(M&RA))—
  - (1) Establishes overall Army health and preventive medicine policy.
  - (2) Maintains oversight of medical and health aspects of the Army Radiation Safety Program.
- c.* The Director of Army Safety (DASAF), Office of the Chief of Staff, Army—
  - (1) Chairs the Army Radiation Safety Council (ARSC) as the Army Staff component providing oversight of the Army Radiation Safety Program.
  - (2) Provides Army policy recommendations and directives to implement the requirements of 10 CFR, 49 CFR, and applicable DOD regulations.
  - (3) Administers, directs, and integrates Army force protection composite risk management (CRM) (AR 385-10, DA Pam 385-3, and FM 5-19).
- d.* The Commanding General (CG), U.S. Army Materiel Command (AMC)—
  - (1) Exercises administrative control over Nuclear Regulatory Commission (NRC) licenses and Army radiation authorizations for Army radioactive commodities within AMC's purview. This function is routinely managed by AMC major subordinate commands (MSCs). This includes, but is not limited to—
    - (a)* Acquiring, amending, and maintaining NRC licensees for radioactive commodities.
    - (b)* Exercising administrative control over licenses.
    - (c)* Coordinating NRC license correspondence with applicable commands and the Army radiation safety officer (RSO).
    - (d)* Reporting license violations to the NRC in accordance with 10 CFR and notifying the Army RSO.
    - (e)* Performing or coordinating license compliance audits for activities that use AMC licensed radioactive commodities.
    - (f)* Coordinating with U.S. Army Training and Doctrine Command (TRADOC) and U.S. Army Medical Command (MEDCOM) to ensure training materials meet NRC license conditions.
  - (2) Provides personnel dosimetry services through the Army Dosimetry Center (ADC). The Chief, ADC (in accordance with 10 CFR 20.1501(c) and AR 385-10, chap 7)—
    - (a)* Publishes instructions for starting, maintaining, and ending personnel dosimetry services.
    - (b)* Maintains the Army's Central Dosimetry Records Repository (CDRR). The CDRR will archive comprehensive dosimetry records for all Army personnel and for other personnel who use Army dosimetry services. Records will meet the requirements of 10 CFR 20.2106 and 20.2110, and OSHA 1910.1096(b)(2)(iii). Records will include results of bioassays, administrative dose assignments (including copies of documents that make the assignments), and supplementary occupational dose equivalent information (for example, dosimetry information resulting from off-duty employment, "moonlighting") that any RSO reports. In particular, the ADC will meet the requirements of 10 CFR 20.2106(f) for long-term retention of these records.
    - (c)* Provides personnel dosimetry reports (automated dosimetry record (ADR)) to RSOs for all personnel who received dosimetry services during the previous calendar quarter. These reports will enable supported RSOs to meet all recordkeeping requirements in 10 CFR 20.2106.

- (d) Provides reporting services that enable RSOs to meet all requirements of 10 CFR 19.13, 29 CFR 1910.1096(n) and (o), and 29 CFR 1926.53(p) and (q).
- (e) Provides reporting services that meet the requirements of 10 CFR 20.2206.
- (f) Notifies immediately (by telephone or message) the RSO, the radiological hygiene consultant to The Surgeon General (TSG), Army Headquarters (Army Command (ACOM), Army Service Component Command (ASCC), or Direct Reporting Unit (DRU)) radiation safety staff officer (RSSO), and the Army RSO when dosimetry results indicate that any Army personnel ionizing radiation exposure standard (see table 5–1) may have been exceeded.
- (3) Provides Army low-level radioactive waste disposal services (by the Army Low-Level Radioactive Waste Disposal Division, U.S. Army Joint Munitions Command, ATTN: AMSJM-SF, Rock Island, IL 61299–6000). In addition—
  - (a) Establishes procedures for implementing the Army’s responsibility as DOD Executive Agent for Low-Level Radioactive Waste Disposal.
  - (b) Maintains records of all Army radioactive waste disposal by burial or recycling.
  - (4) Provides the Army radiation test, measurement, and diagnostic equipment (TMDE) program and accredited radiation instrument calibration services (see AR 750–43 and TB 750- 25).
  - (5) Assumes responsibility in the event of an NRC violation or radiation accident at a facility involving AMC licensed radioactive materials that result in NRC Escalated Enforcement Action against an AMC commodity licensee, any resulting administrative civil penalty will ultimately be divided between AMC and the responsible command as mutually agreed between their respective radiation safety offices, based on an evaluation of the nature of the alleged violations and penalty assessment.
  - (6) Ensures that foreign military sales of radioactive material (RAM) and items that contain RAM comply with applicable United States regulations and DOD directives.
- e. TSG—
  - (1) Approves and provides excess limits of radiation doses (see chap 5 and AR 385–10) to the Army RSO for promulgation as necessary (see para 1–4m(3)).
  - (2) Provides Army Staff supervision on the medical aspects of ionizing and non-ionizing radiation injury.
  - (3) Develops radiological health criteria and guidelines for use by Combatant Commanders (COCOMs) to support deployment operations (see Joint Publication 3–11, AR 40–5).
- f. The CG, TRADOC—
  - (1) Integrates appropriate radiation safety training in military occupational specialty/specialty skill identifier (MOS/SSI) producing courses.
  - (2) Makes available radiation safety training modules for deploying and deployed personnel about protection from U.S. and foreign ionizing and non-ionizing radiation sources (including depleted uranium munitions) that may expose Army personnel to radiation during deployment (see AR 385–10).
  - (3) Provides short courses to qualify unit, garrison, installation, Army National Guard (ARNG) and U.S. Army Reserve (USAR) RSOs. (For the purposes of this pamphlet, short courses are generally three weeks or less in duration).
  - (4) Coordinates training material with appropriate Army commodity licensees and MEDCOM to ensure NRC and Army radiation authorization (ARA) compliance with training materials.
- g. The CG, MEDCOM—
  - (1) Makes available radiation safety training modules for deploying and deployed personnel about health hazards of, protection from, and medical treatment of injuries caused by U.S. and foreign radiation sources (including depleted uranium munitions) that may expose Army personnel during deployment.
  - (2) Provides, with services available from the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM), Radiation Safety Program assessment services for garrison surveys to assist and ensure NRC license, Army reactor permit, or ARA holder regulatory compliance.
  - (3) Establishes, when required, appropriate occupational health surveillance programs for personnel occupationally exposed to radiation.
  - (4) Performs health hazards assessments (HHAs) of commodities and systems that emit radiation or contain RAM as early as practical in development and before fielding (see AR 40–10).
  - (5) Provides, with services available from USACHPPM, radiation bioassay services (see AR 40–5 and ANSI N13.30).
  - (6) Provides medical support for investigations of alleged radiation exposures in excess of established limits (see DODI 6055.11 and DA Pam 40–18).
  - (7) Coordinates training material with AMC commodity licensees, ARA holders and TRADOC to ensure field compliance with AMC NRC licenses and ARAs.
- h. The Assistant Chief of Staff for Installation Management (ACSIM) provides oversight for all radioactive contamination surveys conducted in support of base closure or installation restoration activities. Such surveys shall be conducted in accordance with applicable state, local, and NRC requirements, interagency guidance (that is, Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)), agreements with regulatory agencies, and when



consistent with other requirements, Headquarters (HQ), AMC guidance for surveying radioactive commodity sites. Coordination with the responsible NRC license holder and/or ARA holder is required.

*i.* Each ACOM, ASCC, DRU commander/director—

(1) Ensures command compliance with conditions of NRC licenses and ARAs, including AMC-held radioactive commodity licenses (see para 2-1*b*). Consider the use of memoranda of agreement or similar mechanisms to clarify the relationship between the Army Headquarters ACOMs, ASCCs, DRUs and the NRC license holder.

(2) Designates, in writing, a trained radiation safety staff officer (RSSO).

(3) Issues ARAs (see para 2-3).

(4) Establishes and employs, as applicable, procedures to ensure that captured, purchased, borrowed, or otherwise obtained foreign equipment and materiel are surveyed for RAM and that appropriate actions are taken following discovery of any RAM in those items.

(5) Maintains the Radiation Safety Program by—

(*a*) Establishing review and approval procedures for integrating CRM in accordance with FM 5-19 and DA Pam 385-30.

(*b*) Maintaining a central register of risk decisions regarding deviations from the Army standards of this pamphlet and DA Pam 40-18 within the command. Provide a copy to affected NRC license holders.

(*c*) Ensuring that CRM process is executed before the conduct of all operations.

(*d*) Ensuring, for programs under their purview, that each NRC license, Army reactor permit, ARA holder, and Army garrison is surveyed periodically for compliance with applicable radiation safety and health regulations and guidance. These surveys will be performed at a frequency commensurate with the associated hazard but not to exceed three years. These services may be provided by USACHPPM.

(6) Reports excess military-exempt light amplification by stimulated emission of radiation (LASERS) to the Defense Reutilization and Marketing Service for utilization screening within DOD (see DOD 4160.21-M-1) (see para 3-2*c*).

(*a*) Maintaining accountability during the screening period.

(*b*) Losing and gaining organizations will transfer excess directly between themselves.

(*c*) Identifying requirements for usable parts and return them to the supply system after utilization screening is completed.

(7) Ensures that in the event of an NRC violation or radiation accident at a facility involving AMC licensed radioactive materials that result in NRC Escalated Enforcement Action against an AMC commodity licensee, any resulting administrative civil penalty will ultimately be divided between AMC and the responsible command as mutually agreed between their respective radiation safety offices, based on an evaluation of the nature of the alleged violations and penalty assessment.

*j.* The CG, each ASCC—

(1) Ensures subordinate command compliance with Radiation Safety Program requirements.

(2) Designates, in writing, a command RSSO.

(3) Establishes and employs, as applicable, procedures to ensure that captured, purchased, borrowed, or otherwise obtained foreign equipment and material are surveyed for RAM, and that appropriate actions are taken following discovery of any RAM in those items.

(4) Ensures that the CRM process is executed before the conduct of all radiation operations.

(5) Ensures subordinate command compliance with conditions of Army NRC licenses and Army Radiation Authorizations.

(6) Assists AMC commodity license manages in ensuring NRC license compliance within the command.

(7) Ensures that in the event of an NRC violation or radiation accident at a facility involving AMC licensed radioactive materials that result in NRC Escalated Enforcement Action against an AMC commodity licensee, any resulting administrative civil penalty will ultimately be divided between AMC and the responsible command as mutually agreed between their respective radiation safety offices, based on an evaluation of the nature of the alleged violations and penalty assessment.

*k.* Each commander or director—

(1) Designates, in writing, a RSO when any of the following is true:

(*a*) An NRC license, Army reactor permit, ARA, or applicable technical publication requires it.

(*b*) Paragraph 5-1*d* requires any personnel in the command to wear ADC issued dosimetry.

(*c*) Paragraph 5-1*e* requires any personnel in the command to participate in a bioassay program.

(*d*) The activity operates, maintains, or services a Class 3b or Class 4 LASER system (see ANSI Z136.1, section 1.3) that is not type-classified. The title of the person so designated is "LASER safety officer" (LSO).

(*e*) A deployable unit possesses radioactive commodities or radiation emitting equipment that requires the implementation of a Radiation Safety Program (that is, leak testing, radiation postings, shipping requirements).

(2) Ensures that when paragraph 1-4*k*(1), above, requires the designation of an RSO, LSO, or radio frequency safety officer (RFSO)—

- (a) The RSO, LSO, or RFSO designee is trained (and periodically retrained, as necessary) to a level commensurate with the Radiation Safety Program scope and responsibilities (see chap 7).
- (b) Established written policies and procedures to ensure compliance with applicable Federal, DOD, and Army radiation safety regulations and directives. These documents will include emergency reaction plans as necessary and procedures for investigating and reporting radiation accidents, incidents, and overexposures (see chap 6).
- (c) An internal or external agent or agency audits the Radiation Safety Program annually and copy furnish the garrison RSO.
- (3) Ensures that all personnel occupationally exposed to radiation receive appropriate radiation safety training commensurate with potential work place hazards.
- (4) Maintains an inventory of radiation sources as higher headquarters directs and in accordance with requirements of NRC licenses, Army reactor permits, ARAs, and technical publications. Inventories shall be updated annually or more often if required by NRC license conditions or local procedure. A copy of the inventory shall be furnished to the garrison RSO annually (or more frequently if necessitated by inventory changes).
- (5) Establishes written policies and procedures to ensure compliance with radiation safety requirements in applicable technical publications governing the use of radioactive commodities (see para 2-1b(1)).
- (6) Establishes Radiation Safety Committees (RSCs) required by technical publications or conditions of an NRC license, Army reactor permit, or ARA, in accordance with paragraph 1-7.
- (7) Oversees the integration of CRM into the Army Radiation Safety Program.
- (8) Reports radiation accidents/incidents when required by DA Pam 385-40 or Title 10 CFR to the chain of command, the appropriate NRC license holder, and the garrison RSO.
- (9) Designates, in writing, a RFSO whenever there are radio frequency (RF) sources that exceed the permissible exposure limits of DODI 6055.11.
- l. Each garrison commander—*
  - (1) Designates, in writing, a trained Garrison RSO.
  - (2) Establishes an RSC (see para 1-8).
  - (3) Prepares and maintains historical records of location of use or storage of RAM on the installation and the responsible activity for that use or storage (see para 2-5).
  - (4) Maintains documentation listing locations categorized as “RF controlled” and “RF uncontrolled” environments (as defined by DODI 6055.11).
  - (5) Issues Army radiation permits (see para 2-4 and AR 385-10, chap 7).
  - (6) Obtains radiation safety resources from outside the command by contracting, Memorandum of Agreement, or Memorandum of Understanding, as necessary, to meet the garrison Radiation Safety Program requirements if the organization lacks organic capability.
  - (7) Maintains an inventory of radiation sources as higher headquarters directs and in accordance with requirements of NRC licenses, Army reactor permits, ARAs, and technical publications. Inventories shall be updated annually or more often if required by NRC license conditions or local procedure.
  - (8) Establishes written policies and procedures to ensure compliance with radiation safety requirements in applicable regulations and technical publications governing the use of radioactive commodities (see para 2-1b(1)).
- m. The Army RSO—*
  - (1) Directs the Army Radiation Safety Program on behalf of the DASAF.
  - (2) Develops, manages, and promulgates Army radiation safety policy and guidance on behalf of the DASAF.
  - (3) Promulgates Federal and Army radiation safety personnel exposure standards within the Army in coordination with the radiological hygiene consultant to TSG.
  - (4) Provides HQDA oversight of the DOD Executive Agency for Low-Level Radioactive Waste, to include matters concerning depleted uranium on behalf of the ASA(I&E).
  - (5) Resolves radiation safety issues among Army Headquarters (ACOM, ASCC, DRU) and the U.S. Army Installation Management Command (IMCOM) as necessary.
  - (6) Promotes good radiation safety practices throughout the Army.
  - (7) Provides radiation safety consultation to the DA staff, Army Headquarters (ACOM, ASCC, DRU) commanders and staffs, and IMCOM directors and their staffs.
  - (8) Serves as HQDA radiation safety point of contact with other DOD and Federal agencies.
  - (9) Represents HQDA on DOD radiation safety committees, working groups, and panels.
  - (10) Provides technical input to HQDA-level radiation safety plans and responses to radiation emergencies, accidents, and incidents.
- n. The ACOMs, ASCCs, DRUs RSSOs—*
  - (1) Ensures implementation of Army radiation safety policy within their respective areas of responsibility.
  - (2) Directs their command’s Radiation Safety Program.
  - (3) Establishes radiation safety policy for their respective areas of responsibility.

- (4) Provides radiation safety consultation to their respective command and leadership chains, staffs, and to subordinate commanders and staffs.
  - (5) Coordinates reporting of radiation accidents/incidents involving radioactive material or machine generating devices with the applicable licensee or permit holder.
  - (6) Serves as their organization's radiation safety point-of-contact.
- o. ASCC RSSO—*
- (1) Serves as the principal advisor to the Commander, ASCC and staff on Radiation Safety Program issues.
  - (2) Provides centralized, theater-level oversight and guidance to health physics/radiation safety personnel, and radiological response teams.
  - (3) Manages transition-to-war radiation safety issues involving radioactive commodities, x-ray generating devices such as the Lorad LPX-160, radiation survey instrument calibration, radiation safety training, depleted uranium training, radiation dosimetry, LASER safety, and RF radiation safety.
  - (4) Monitors the oversight of and guidance on depleted uranium (DU) issues, to include friendly fire incidents, battle-damaged vehicle recovery, and contamination.
  - (3) Provides guidance on damaged radioactive commodities, and coordination with continental United States (CON-US)-based NRC license holders.
  - (4) Evaluates reports from health physics/radiation safety personnel and radiological response teams, and guidance to the command staff in the event of a radiological or nuclear event.
  - (5) Ensures radiological detection equipment, sampling equipment, and personnel dosimetry are used, stored, and maintained in accordance with applicable technical manuals and guides.
  - (6) Designs and directs the implementation and execution of the radiation survey program (other than combat surveys for nuclear weapon fallout).
  - (7) Conducts comparisons of radioactive survey sampling results against pre-set action levels and communicating survey results and analyses to the command staff.
  - (8) Manages radiation safety redeployment issues involving radioactive commodities, radioactive waste, and radioactively contaminated vehicles and equipment, including, when applicable, foreign radioactive sources.
  - (9) Coordinates with medical support on the identification and follow-up of Soldiers potentially contaminated with DU.
- p. Each garrison RSO—*
- (1) Establishes and directs the garrison Radiation Safety Program (to include a written Radiation Safety Program document).
  - (2) Assists units, tenants, civilian activities, and contractors on the installation to meet requirements of NRC licenses and ARAs for radioactive commodities. In particular, the garrison RSO—
    - (a) Provides units with radiation safety training support.
    - (b) Reports accidents or incidents involving IMCOM activities or units to the applicable NRC Licensee and the IMCOM RSSO (see para 6-1).
    - (c) Advises on appropriate RAM inventory control and security.
  - (3) Notifies the affected mission commander and the AMC RSSO (Army Materiel Command Radiation Safety Staff Officer, 9301 Chapek Road, Fort Belvoir, VA 22060) when a building or area that currently or formerly contained radioactive commodities is scheduled for demolition or will no longer contain radioactive commodities. This is to provide all stakeholders appropriate notice so that they can take decommissioning actions as necessary.
  - (4) Ensures tenant organizations/units are in compliance with NRC licenses and ARAs.
  - (5) Administers the garrison Army radiation permit (ARP) program (to include maintaining records of ARP applications and ARPs issued by the garrison commander) (see para 2-4).
  - (6) Administers the garrison radiation safety committee, if applicable.
  - (7) Document, stores, retains, and preserves garrison Radiation Safety Program records properly, including radiation contamination survey reports in accordance with AR 25-400-2, to ensure availability during decontamination and decommissioning of facilities.
  - (8) Coordinates with mission RSOs, medical officials, and emergency response personnel (both military and civilian if appropriate) to establish plans and procedures for responding to credible radiation emergencies on the installation.
  - (9) Coordinates with the medical authority on occupational monitoring requirements for garrison radiation workers.
  - (10) Provides training, guidance, and technical support to garrison security forces with fixed or portable radiation detection systems, or mobile imaging systems used for force protection purposes.
- q. Each RSO, LSO, or RFSO, including the garrison RSO, will provide the following functions, for radiation sources within their organization's responsibility:*
- (1) Perform or be responsible for the performance of all radiation safety functions that applicable Federal, DOD, and Army regulations and NRC licenses, Army reactor permits, and ARA conditions require.
  - (2) Properly document, store, retain, and preserve Radiation Safety Program records, including annual physical

inventories and radiation and contamination survey reports, to ensure availability during decontamination and decommissioning.

(3) Establish plans and procedures for handling credible emergencies involving radiation and radioactive materials. This includes coordination with civilian and military emergency response organizations as necessary.

(4) Coordinate with supporting medical personnel to ensure that personnel receive appropriate occupational health surveillance (see AR 40–5).

(5) Assume other responsibilities—

(a) For an RSO with LASER safety responsibilities, assume the responsibilities of an LSO as listed in section 1.3.2, ANSI Z136.1, except for occupational health responsibilities. (The RSO or LSO will assist the occupational health physician as necessary in meeting LASER occupational health responsibilities.)

(b) For an RFSO, assume the duties of a RFSO as listed in section 4.1.2.1 (Duties of the RFSO), IEEE C95.7. (The RFSO will assist the occupational health physician as necessary in meeting RF occupational health responsibilities.)

r. Each unit RSO—

(1) Receives instruction on the types of radioactive commodities within the unit.

(2) Provides user-level training in the radiation safety aspects of radioactive commodity use or ensure users receive required training.

(3) Develops and maintains a unit standing operating procedure (SOP) for storage, inventory, tracking, and leak testing of radioactive commodities and response to broken and damaged radioactive devices.

(4) Manages the inventory of radioactive commodities for the unit.

(5) Conducts annual physical inventories and forward the inventory to the applicable NRC licensee.

(6) Coordinates with the Serialization Officer to ensure that applicable transactions are entered into the DOD Radiation Tracking and Testing System (RATTS) database in accordance with AR 710–3 as required. While deployed, tracking per AR 710–3 is not required.

(7) Stores and secures radioactive commodities properly in locked and properly posted locations when not in use. (While deployed, the unit RSO stores and secures radioactive commodities consistent with mission, enemy, terrain, troops, time available, and civilian considerations (METT–TC)).

(8) Conducts surveys of storage areas, as required by the appropriate NRC license.

(9) Performs (or have performed by direct support units) periodic leak tests, as required.

(10) Establishes and maintains a personnel dosimetry program (when required).

(11) Conducts transportation surveys and ensure that radioactive commodity shipments are certified by a qualified Hazardous Material (HAZMAT) shipping official when required.

(12) Provides shipping information, to include appropriate exposure rate and contamination levels, to the transportation officer or HAZMAT officer prior to shipment.

(13) Investigates accidents or incidents involving lost, stolen, broken, damaged radioactive commodities or malfunctioned safety devices of radioactive commodities.

(14) Coordinates with medical authorities on follow-up to possible personnel exposure to RAM.

(15) Secures and stores damaged radioactive commodities properly.

(16) Reports the event to the garrison RSO, the ACOM, ASCC, DRU RSSO, and the affected NRC license RSO.

(17) Reports lost or damaged radioactive commodities in accordance with DA Pam 385–40, AR 385–10, and AR 735–5 (filling DA Form 285–AB–R (U.S. Army Abbreviated Ground Accident Report) and a report of survey as required).

(18) Initiates request for disposal of damaged device through the garrison, ACOM, ASCC, DRU RSSO and NRC license RSO.

(19) Maintains Radiation Safety Program records.

(20) Maintains “ACTIVE” (health and safety calibrated) calibrated RADIAC instruments required to perform mandated surveys.

## **1–5. Army Radiation Safety Program**

a. The Army’s Radiation Safety Program includes all aspects of—

(1) Measurement and evaluation of radiation and radioactive material pertaining to protection of personnel and the environment.

(2) Army compliance with Federal, including NRC license conditions, and DOD radiation safety regulations and Status of Forces Agreements (SOFA).

(3) The Army’s radiation dosimetry, radiation bioassay, radioactive waste disposal, radiation safety training, and TMDE radiation instrument calibration programs.

b. A command’s Radiation Safety Program includes all aspects of—

(1) Measurement and evaluation of radiation and radioactive material within the command as they pertain to protection of personnel and the environment.

- (2) Compliance with Federal, DOD, and Army radiation safety regulations and SOFA agreements.
- c. Radiation Safety Program policy is developed and promulgated at the DA level. The program is implemented at the HQDA (ACOM, ASCC, DRU) level where commanders may organize internally at their discretion to implement the Radiation Safety Program, provided that the requirements of this pamphlet are met.
- d. Army radiation activities will be conducted so as to ensure that radiation exposures are as low as reasonably achievable (see glossary).

#### **1-6. Army Radiation Safety Council**

- a. The ARSC is the advisory body to Chief of Staff, Army, providing recommendations for Army radiation safety directives and gathering and disseminating information about the status of the Army Radiation Safety Program.
- b. Membership in the ARSC includes the DASAF as chair (see para 1-4c(1)), the Army RSO as recorder, the radiological hygiene consultant to TSG, and representatives of the ACSIM (Assistant Chief of Staff for Installation Management), the Army Reactor Office (see AR 50-7), the Director, IMCOM, and the RSSO from each HQDA ACOM, ASCC, DRU, NGB, and OCARs.
- c. The ARSC shall meet once each sixth-month period and at the call of the chair.

#### **1-7. Army Headquarters (Army Command, Army Service Component Command, Direct Reporting Unit)/U.S. Army Installation Management Command Radiation Safety Council**

- a. The Army HQ (ACOM, ASCC, DRU)/IMCOM Radiation Safety Committee (RSC) is the advisory body to the Army HQ (ACOM, ASCC, DRU) commander/IMCOM director that provides recommendations for radiation safety directives and gathers and disseminates information about the status of the Radiation Safety Program.
- b. Membership includes the commander/director as chair (or a designee who is a senior member of the commander's/director's staff), the RSSO (recorder), major subordinate command RSOs, and separate organization RSOs. The RSSO may not serve as the chair.
- c. Each Army HQ (ACOM, ASCC, DRU)/IMCOM RSC should meet at least once each six month period and at the call of the chair.

#### **1-8. Garrison Radiation Safety Committee**

When the garrison commander establishes an RSC—

- a. The RSC is the advisory body to the commander that gathers and disseminates information about the status of the garrison Radiation Safety Program.
- b. Membership includes the commander as chair (or a designee who is a senior member of the commander's staff), the garrison RSO (recorder), and all tenant RSOs. Installations with large numbers of table of organization and equipment (TOE) unit personnel that use radioactive commodities will include military representatives knowledgeable about the TOE units' radiation safety programs.
- c. Each RSC will meet at least once each calendar year and at the call of the chair.

#### **1-9. Radiation Safety Committee**

When a technical publication or condition of an NRC license, Army reactor permit, or ARA requires an RSC, it will meet the following requirements in addition to any other requirements of applicable directives:

- a. The RSC will meet at least once in each 6 month period and at the call of the chair.
- b. The commander or a designated representative (someone at the executive level in the organization who is not a radiation user) should chair the RSC. The RSO should be the recorder and will be a voting member. If the RSO is not serving concurrently as the garrison RSO, the garrison RSO may be a non-voting member.
- c. The mission or tenant activity RSO will provide a copy of the minutes of each RSC meeting to the committee members, and an information copy to the garrison RSO.

#### **1-10. Deviations**

a. The following personnel may authorize deviations from Army Radiation Safety Program requirements on the advice of their RSSO. (Deviations from personnel radiation exposure standards require the approval of TSG and the DASAF).

- (1) The CG of each ACOM, ASCC, and DRU.
- (2) The Director, IMCOM.
- (3) The Superintendent, United States Military Academy.
- (4) The Chief, NGB. (The Chief, NGB may sub-delegate deviation authority to the State Adjutants General.)
- (5) The Chief, Army Reserve (CAR). (The CAR may sub-delegate deviation authority to MSC commanders, but no lower than the first O-8 in the chain of command).
- b. The approval authority may grant deviations for a period of 1 year or less. The approval authority may extend authorized deviations in increments of 1 year or less provided conditions cited in the original deviation remain the same.

c. Any accident or incident occurring under an approved deviation will result in immediate termination of the approval until the approving authority completes an investigation and the DASAF revalidates the deviation.

d. Requests for deviations from Federal and DOD regulations and standards require the endorsement of the DASAF, and in the case of radiation exposure standards, TSG. Forward requests for deviations to Federal or DOD radiation safety regulations through command channels to the Director of Army Safety, ATTN: DASAF, 223 23rd St., Room 980, Arlington, VA 22202. Copy furnish the NRC licensee or ARA holder.

## **Chapter 2**

### **Ionizing Radiation Sources**

#### **2-1. General**

a. AR 70-1 and DA Pam 385-16 apply to developmental and non-developmental materiel containing radiation sources (including commercial off the shelf (COTS) equipment). Follow the guidance of DA Pam 70-1.

b. Compliance with NRC regulations and NRC licenses, Army reactor permits, ARA, and Army reactor permit (ARP) conditions.

(1) Army personnel using RAM (including industrial radiography sources) will comply with all applicable NRC regulations and conditions of NRC licenses, ARPs, and ARAs held by their own or by another command (see paras 2-2a(2) and 2-3b(1)).

(2) Holders of NRC licenses, ARPs, and ARAs will ensure that all personnel using RAM, radiation sources, or emergency responders that may encounter radiation, are aware of applicable regulations and conditions as appropriate.

(3) Radiation exposures not governed by the NRC are governed by Occupational Safety and Health Administration (OSHA). For Army radiation exposures, the dose limits of this pamphlet apply when more restrictive than OSHA regulations.

c. A qualified expert (see glossary) will design, review, and test shielding of and controls for access to radiation areas, high radiation areas, and very high radiation areas. Perform these procedures per applicable regulations and guidelines before routinely using radiation sources within the area. Each design for high radiation and very high radiation areas shall receive an independent review by a qualified expert designated by DASAF, or an American Board Health Physics (ABHP) certified health physicist designated by DASAF.

d. Adopt no practice and conduct no operation involving planned exposure of personnel to ionizing radiation in excess of the applicable exposure standards of table 5-1 (other than deployment operations governed by Operational Exposure Guidance).

e. Environmental requirements (see 40 CFR, AR 200-1, and AR 200-2 for RAM environmental requirements).

f. Outside continental United States (OCONUS) control of radiation sources will be in conjunction with host nation authorizations, SOFAs, Army regulations, and other international agreements as applicable.

#### **2-2. Nuclear Regulatory Commission licenses**

The NRC licenses special nuclear, source, and by-product material in the U.S. and its possessions.

a. Send applications for new licenses, license renewals, and license amendments through command channels to the HQDA (ACOM, ASCC, DRU) or IMCOM headquarters RSSO, as appropriate, for review and forwarding to the NRC.

(1) The CG of each ACOM, ASCC, or DRU or Commander, IMCOM may allow subordinate commanders to forward applications directly to the NRC without Army HQ (ACOM, ASCC, DRU) or IMCOM HQ review. The applicant shall provide a copy of the application to the Army HQ (ACOM, ASCC, DRU) or IMCOM RSSO, as appropriate. Applicant organizations are responsible for licensing fees.

(2) When compliance with proposed license conditions in the application impacts another command, the license holding RSO will provide license copies and amendments to the various commands. The commands will utilize the AMC commodities in accordance with its intended purposes. This requirement does not apply to Army licenses for Army radioactive commodities within AMC's purview as specified in paragraph 1-4d.

(3) The applicant or Army HQ (ACOM, ASCC, DRU) RSSO will provide a copy of all correspondence relating to NRC license and amendment applications to Commander, USACHPPM, Aberdeen Proving Ground, MD 21010-5403 for archiving, to include environmental documentation required by AR 200-2.

(4) Tenant/mission commanders shall provide a copy of each NRC license and ARA (including all amendments) possessed by their command, to the garrison commander.

b. Army personnel may communicate Radiation Safety Program concerns directly to the NRC without restriction. Personnel are encouraged to first report concerns to the chain of command for resolution.

c. When contract employees perform Army radiation work in Army facilities, on Army installations, under the auspices of any Army NRC license, the contract must contain specific requirements tying the contract work force to license conditions and other administrative requirements of the Radiation Safety Program. Contractors will obtain NRC licenses on Government-owned contractor operated (GOCO) facilities versus working under Army NRC licenses on

Army property and if possible obtain NRC licenses for their operations on Army property. Contractors may not work under the auspices of any Army NRC license in non-Army facilities, or at off-post locations. Contact the Army RSO for guidance.

### **2-3. Army radiation authorizations**

a. The Army uses ARAs to control ionizing radiation sources that the NRC does not license (including machines that emit ionizing radiation).

b. The Army's ARA program is similar to the NRC's licensing program. The Army applies NRC regulations and guidance, modified as necessary, in its control of ARA ionizing radiation sources. Most ARA conditions are similar to standard NRC license conditions.

(1) When an ARA applicant for a radioactive material program possesses an NRC license to which ARA RAM use can be linked, the application need only reference the NRC license. The issued ARA may reference the NRC license and incorporate the expiration date and all conditions of the NRC license.

(2) The NRC's regulations regarding license-exempt concentrations (see 10 CFR 30.14) and quantities (see 10 CFR 30.18) are applied similarly to ARA exemption upon HQDA approval. Applicants for such exemptions will send supporting documents through command channels to the Director of Army Safety, ATTN: DACS-AF, 223 23rd Street, Room 980, Arlington, VA 22202.

c. An ARA is required for all sources not regulated by NRC except—

(1) Byproduct, source, or special material that the NRC has declared to be license-exempt (see 10 CFR 30, sections 30.14 through 30.20; 10 CFR 40, sections 40.13 and 40.14; and 10 CFR 70, section 70.14) or generally licensed (see 10 CFR 31; 10 CFR 40, sections 40.20 through 40.28; and 10 CFR 70, section 70.19).

(2) Less than 0.1 microcurie ( $\mu\text{Ci}$ ) (3.7 kilobecquerels (kBq)) of radium.

(3) Electron tubes containing less than 10  $\mu\text{Ci}$  (370 kBq) of any naturally occurring or accelerated produced radioactive material (NARM) radioisotope.

(4) Machine-produced ionizing radiation sources not capable of producing a high radiation area or very high radiation area (for example, 100 millirem in one hour at 30 centimeters from any surface of the device). (For example, medical and dental diagnostic x-ray systems, and some battery powered pulsed x-ray systems do not require an ARA.) However, commanders will establish policies and procedures to ensure that design and use of these excepted sources are in compliance with applicable radiation safety regulations and guidelines and that only appropriately trained and authorized personnel operate them.

(5) Army nuclear reactors and Army reactor-produced RAM that remains at the reactor site are permitted by the Army Reactor Office (see AR 50-7).

d. In special cases where NRC general license requirements attach to centrally purchased radioactive devices, the CG, AMC, can issue an ARA to ensure that the general license requirements are met, the provisions of paragraph 2-3c(1) not withstanding. An ARA must be issued for NRC generally licensed higher activity devices in accordance with 10 CFR 30.5(c)(13)(i). In the case of centrally purchased machine generated devices, the CG, AMC, can issue an ARA to ensure that the safety requirements are met.

e. Forward applications for new ARAs, ARA renewals, and ARA amendments through command channels to Army HQ (ACOM, ASCC, DRU) or IMCOM headquarters, as appropriate, for approval.

(1) Use DA Form 3337 (Application for Army Radiation Authorization) (locate the form on the Army Publishing Directorate Web site at <http://www.apd.army.mil>) for new ARAs. Use either DA Form 3337 or a memorandum that refers to the original DA Form 3337 for ARA renewals and amendments.

(2) When compliance with conditions proposed in the application requires efforts of personnel of another command, obtain a concurrence from an authorized representative of that command (see para 2-2a(2)).

(3) The RSSO will ensure that applications meet appropriate regulatory and advisory guidelines before sending approval through command channels to the applicant.

(4) Tenant commanders will provide a copy of each ARA, including all amendments, to the garrison commander.

f. The Army HQ (ACOM, ASCC, DRU) commander/director, HQ IMCOM, in consultation with the Army HQ (ACOM, ASCC, DRU)/IMCOM RSSO is the termination authority for ARAs issued by the Army HQ (ACOM, ASCC, DRU)/HQ IMCOM. The ARA can be terminated in one of two ways—

(1) An ARA that is linked directly to an NRC license terminates concurrently with the NRC license, providing that all of the ARA radioactive material/radiation devices and use areas are appropriately dispositioned in accordance with the terms of NRC license termination plan.

(2) An ARA that is not linked to an NRC license shall follow the same general course as terminating NRC licenses. A termination plan approved by the Army HQ commander/director, HQ IMCOM is required. The RSSO is advised to consult USACHPPM or the Army RSO for guidance.

g. The RSSO shall provide a copy of all correspondence relating to ARA applications and terminations to commander, USACHPPM, Aberdeen Proving Ground, MD 21010-5403 for archiving.

h. A sample ARA memorandum is in figure 2-1.

## **2-4. Army radiation permits**

Non-Army agencies (including other military services, vendors, and civilian contractors) require an ARP to use, store, or possess ionizing radiation sources on an Army installation (see 32 CFR 655). Non-Army applicants will apply by letter with supporting documentation (see para 2-4a, below) to the garrison commander. The letter should be submitted such that the garrison commander receives the application at least 30 days before the requested start date of the permit (see AR 385-10, chap 7).

a. The ARP application will specify start and stop dates for the ARP and describe the intended use of the radioactive material. For sealed sources, an affirmation that leak test requirements are current shall be included in the application. The garrison commander will approve the application only if the applicant provides evidence to show that one of the following is true:

(1) For installations that maintain exclusive Federal jurisdiction, and installations in NRC non-agreement states, the ARP applicant must possess one of the following that allows the applicant to use the source as specified in the ARP application:

- (a) A valid NRC license.
- (b) A Department of Energy (DOE) radiological work permit (for work performed under DOE regulations).
- (c) A State radioactive material license with an NRC reciprocity agreement. The ARP applicant establishes reciprocity by submitting an NRC Form 241 (Report of Proposed Activities in Non-Agreement States, Areas of Exclusive Federal Jurisdiction or Offshore Waters) to the NRC in accordance with 10 CFR 150.20. The NRC limits work performed under a reciprocity agreement to 180 days in a calendar year. Otherwise, an NRC license is required.

(2) For installations that maintain concurrent jurisdiction with the state, and are located in NRC agreement states, the ARP applicant must possess one of the following that allows the applicant to use the source as specified in the ARP application:

- (a) A state radioactive material license (issued by the state in which the installation is located).
- (b) An out-of-state license with host-state reciprocity. The ARP applicant establishes reciprocity by notifying the host state radioactive materials licensing authority before work commences, and complying with host state reciprocity requirements. Some states limit work under a reciprocity agreement to 180 days in a calendar year.
- (c) An NRC license with host state reciprocity. The ARP applicant establishes reciprocity by notifying the host state radioactive materials licensing authority before work commences, and complying with host state reciprocity requirements. Some states limit work under a reciprocity agreement to 180 days in a calendar year.

(d) A DOE radiological work permit (for work performed under DOE regulations).

(3) The garrison commander should consult the installation staff judge advocate or director of public works to ascertain the jurisdiction status of the area on the installation where the ARP applicant will use the radiation source. (On some installations, jurisdiction varies by location on the installation).

(4) For machine-produced ionizing radiation sources, the applicant has an appropriate state authorization that allows the applicant to use the source as specified in the ARP application or has in place a Radiation Safety Program that complies with Army regulations.

(5) For overseas installations, the applicant has an appropriate host-nation authorization as necessary that allows the applicant to use the source as specified in the ARP application and has in place a Radiation Safety Program that complies with Army regulations. Applicants will comply with applicable SOFAs and other international agreements.

b. All ARPs shall require applicants to remove all permitted sources from Army property by the end of the permitted time.

c. A sample ARP is in figure 2-2.

## **2-5. Decommissioning records**

a. Holders of NRC licenses will establish and maintain decommissioning records in accordance with 10 CFR 30.35(g), 40.36(f), and 70.25(g), as applicable.

b. Holders of ARAs will establish and maintain decommissioning records similar to those that the NRC requires.

c. Tenants holding NRC licenses and ARAs will provide information about the location of use and storage of RAM to the garrison commander for the installation RAM history records (see para 1-4l(3)).

## **2-6. Transfer and transport**

a. Transfer radioactive material only to persons authorized to receive and possess it.

(1) Transfer, sale, or donation of Army radioactive commodities/items shall be in accordance with NRC general license requirements, technical publications, and applicable instructions established by the holder of the commodity license or ARA.

(2) For all other RAM, the shipper will obtain and retain appropriate evidence (for example, a copy of the recipient's ARA or NRC or Agreement State license) before shipping the RAM.

b. Domestic shipments of RAM shall be in accordance with applicable NRC (see 10 CFR 71), Department of Transportation (DOT) (see 49 CFR), and DOD 4500.9-R (Part II) requirements. International shipments of RAM shall



be in accordance with the requirements of the International Air Transport Association (IATA Section 10), and the International Maritime Organization (IMO)/International Maritime Dangerous Goods (IMDG) regulations.

c. Do not transfer radium and items containing radium to non-DOD agencies or activities (except for disposal as radioactive waste).

d. Report lost or damaged shipments of radioactive commodities to the responsible NRC license, ARA, or ARP holder.

## **2-7. Radioactive waste disposal**

a. Army waste generators shall implement a plan to reduce radioactive waste volumes to the extent practicable. Where feasible, a single radioactive waste storage point should be established on the installation.

b. Radioactive items will not be stored with personnel, explosives, flammables, food products, or other incompatible commodities. Items with radioactive gas or radium shall be stored in ventilated structures. Storage areas and containers will be marked in accordance with 10 CFR.

c. Burial of radioactive waste on Army or DOD owned or leased property is prohibited.

d. The U.S. Army Joint Munitions Command is responsible for disposal of Army radioactive waste. Waste generators shall coordinate with and obtain the approval of the Chief, Army Low-Level Radioactive Waste Disposal Division, U.S. Army Joint Munitions Command, ATTN: AMSJM-SF, Rock Island Arsenal, Rock Island, IL 61299-6500, for all disposals of DOD radioactive wastes (including approval for the off-site storage, packaging, shipment, treatment, and final disposition of unwanted low-level RAM). Managers of special projects that generate unusually large amounts of radioactive waste (that is, U.S. Army Corps of Engineers environmental restoration projects) may arrange for radioactive waste disposal as part of the project. However, project managers shall coordinate DOD radioactive waste disposal actions with the Chief, Army Low-Level Radioactive Waste Disposal Division (see para 1-4d(3)).

e. Release of RAM to the atmosphere or to the sanitary sewerage system will comply with all applicable NRC and EPA regulations, and applicable state or local requirements.

f. If allowed by applicable regulations or by NRC licenses, Army reactor permits, or ARA conditions, RAM may be held for decay and subsequent disposal without regard to radioactivity. However, disposal of such material may still require special handling as hazardous waste (see AR 40-5).

## **2-8. Survey instruments**

An adequate number and type of radiation survey meters and monitoring devices shall be available to support the Radiation Safety Program. The RSO must maintain at least two survey instruments to accommodate maintenance and calibration downtime. Calibrate radiation survey instruments used for health or safety purposes at least annually (or as specified in TB 43-0180) using National Institute of Standards and Technology (NIST) traceable radiation sources (see TB 750-25).

a. Some instruments may require more frequent calibration. Consult applicable technical publications and test, measurement, and diagnostic equipment (TMDE) personnel for appropriate calibration intervals as necessary.

b. Calibration sources will be of a type and activity appropriate for the intended use of the instrument.

c. Radiation survey instruments should be response checked with an appropriate check source before and after use. Fixed, walkthrough, portal, or step-in contamination monitors shall be response-checked on a routine basis sufficient to ensure satisfactory operation, in accordance with the manufacturer's instructions. A log should be maintained to document these checks.

d. Calibrating organizations shall adhere to the requirements of American National Standards Institute (ANSI) N323 and TB 9-6665-285-15.

## **2-9. Personnel Security Screening System**

The Army Radiation Safety Program for Personnel Security Screening System (PSSS) shall conform to ANSI N43.17-2002. The annual effective dose to an individual subject to irradiation by PSSS shall be limited to 25 mrem (0.25 millisieverts (mSv)) for a single source or venue. Additionally, the following requirements apply:

a. General-use systems produce an effective dose per scan of 0.01 mrem (0.1 Sv) or less. Due to the low effective dose per scan, these systems can be used generally without regard to the number of individuals scanned or the number of scans per year. No special precautions are required for pregnant women or children. Check manufacturers specifications for determining the type of PSSS installed. If further assistance is needed, consult ANSI N43.17-2002 and/or the local HQ ACOM, ASCC, DRU/IMCOM RSSO.

b. Limited-use systems produce an effective dose per scan greater than 0.01 mrem (0.1 Sv), and less than 1.0 mrem (10 Sv). Users of PSSS in this category shall implement a program to ensure that subjects will not exceed 25 mrem (0.25 mSv) per year as a result of scanning with a given source or at a given venue. Alternative means should be considered for the screening of pregnant women and children. Check manufacturers specifications for determining the type of PSSS installed. If further assistance is needed, consult ANSI N43.17-2002 and/or the local HQ ACOM, ASCC, DRU/IMCOM RSSO.

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**DEPARTMENT OF THE ARMY**  
**HQ, Army Headquarters/Regional IMCOM**  
**CITY, STATE, AND ZIP CODE**

REPLY TO ATTENTION OF

XXXX-XX

16 January 2006

MEMORANDUM FOR Commander, U.S. Army Activity, Installation, City,  
State XXXXX-XXXX

SUBJECT: Army Radiation Authorization (ARA) No. XXX-XX

1. Reference memorandum, HQ, U.S. Army Activity, XXXX-XX-X, 14 November 2003, subject: Application for Renewal of Army Radiation Authorization No. XXX-XX, and enclosures thereto.
2. In accordance with referenced memorandum ARA No. XXX-XX is amended in its entirety to read as follows:
  - a. Expiration date: 31 January 2007.
  - b. Description of machine-produced ionizing radiation source and of radioactive material, its chemical and/or physical form, and maximum amount at any one time authorized under this ARA: See enclosure.
  - c. Authorized use: See enclosure.
  - d. Radiation Safety Officer: CPT Dan Jones.
  - e. Conditions: See enclosure.
3. Except as specifically provided otherwise in this ARA, conduct your program in accordance with the statements, representations, and procedures in the documents, including any enclosures, listed: referenced memorandum.
4. Our point of contact is Mr. John A. Doe, Army Headquarters, Radiation Safety Staff Officer, DSN XXX-XXXX.

FOR THE COMMANDER/DIRECTOR:

Encl

JOHN A. SMITH

as

LTC, GS

Adjutant

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Figure 2-1. Sample Army radiation authorization

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**DEPARTMENT OF THE ARMY  
INSTALLATION  
CITY, STATE, AND ZIP CODE**

**October 6, 2006**

Office of the Garrison Commander

Mr. Peter A. Smith  
President, Jones and Associates, Inc.  
19900 W. 52nd Street  
Austin, Texas 78799

Dear Mr. Smith:

This letter responds to your application dated September 19, 2003, for an Army radiation permit to use a lead-paint analyzer containing no more than 30 millicuries (1.11 gigabecquerels) of cadmium-109. Your application meets the requirements of Army Pamphlet 385-24, The Army Radiation Safety Program, and of title 32, Code of Federal Regulations, part 655, section 655.10. I hereby permit you to use the lead paint analyzer on this installation during the period October 3 through November 21, 2003 in accordance with the terms specified in your application. You must remove all radioactive material from the installation by the end of the permitted time and provide evidence to indicate that you have done so. We do not permit disposal of radioactive material on Army property. Reapply if you wish to use the lead-paint analyzer on this installation after November 21, 2003.

Sincerely,

John A. Doe  
COL, AV  
Commanding

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**Figure 2-2. Sample Army radiation permit**

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## **Chapter 3 LASERS**

### **3-1. General**

*a.* LASER devices shall comply with the provisions of Title 21, CFR Parts 1040.10 and 1040.11. Tactical or outdoor training devices shall comply with 21 CFR to the greatest extent possible (see paragraph 3-2).

*b.* The design of Army LASER safety programs will follow applicable guidelines in ANSI Z136.1, ANSI Z136.3, and ANSI Z136.6. Military-exempt LASER (see para 3-2) users will comply with LASER safety requirements in applicable technical publications.

*c.* Army LASER range safety guidance is in DA Pam 385-63 and MIL-HDBK 828A.

*d.* Use a type-classified or commercial Class 3b or Class 4 LASERs on an Army range only if the DOD LASER System's safety working group (LSSWG) or USACHPPM has performed and documented a LASER hazard evaluation for that specific kind of LASER.

(1) A list of approved LASERs is in MIL-HDBK-828A and TB MED 524. Send requests for approval of an unlisted LASER through command channels to commander, USACHPPM, ATTN: MCHB-TS-OLO, Aberdeen Proving Ground, MD 21010-5403.

(2) Use an unlisted Class 3b and Class 4 LASERs on an Army range for research, development, testing, and evaluation (RDTE) purposes only when authorized by the LSO. Users of such LASERs will comply with paragraph 3-1a, above.

*e.* Only a qualified expert (see glossary) will design, review, and test controls for access to a Class 3b or 4 LASER facility. Users will meet these requirements in accordance with applicable directives before routinely using Class 3b or 4 LASERs within such a facility. A qualified expert will design or review for adequacy all radiation safety SOPs for each such facility.

*f.* Only Class 1, Class 2, and Class 3a LASERs may be used indoors on Army installations as hand-held LASER pointing devices. Class 3b or Class 4 LASERs are prohibited for such purposes.

*g.* Users will adopt no practice and conduct no operation involving planned exposure of personnel to LASER radiation in excess of the applicable exposure guides (see para 5-3a).

*h.* The LSO shall maintain an inventory of LASER devices within the organization and update it annually and more frequently if required by local procedure. LASER users should report inventory changes to the LSO as they occur, and shall report changes annually (or more frequently if required by local procedure).

*i.* See chapter 6 for accident/incident reporting requirements.

### **3-2. Military-exempt LASERs**

*a.* Military-exempt LASERs shall meet as many of the LASER safety standards in 21 CFR 1040 as practical. Where military exempt LASERs cannot comply with provisions of 21 CFR 1040.10, alternative and equally effective controls should be developed. Contracting officers shall provide manufacturers with written confirmation of military exemption.

*b.* Proponents of military-exempt LASERs will include LASER safety requirements in technical publications for siting, operation, and maintenance of these LASERs and LASER systems.

*c.* Dispose of unwanted military-exempt LASERs in accordance with DOD 4160.21-M-1. Do not dispose of potentially usable LASERs or LASER parts through utilization outside DOD, donation, or sale without the prior approval of the Deputy Undersecretary of Defense (Installations and Environment) or designee. Send requests for such disposition through supply channels to the commanding general of the appropriate item manager.

*d.* LASERs intended primarily for indoor classroom training and demonstration, industrial operations, scientific investigations, or medical applications shall not be designated military-exempt. CG, USACHPPM, shall maintain records indicating type of product and manufacturer for all Class 3b and Class 4 military-exempt LASERs.

## **Chapter 4 Radio Frequency Electromagnetic Radiation**

### **4-1. General**

*a.* The Army will comply with RF Radiation Safety Program elements in DODI 6055.11. Type-classified RF electromagnetic radiation (EMR) emitting system users will comply with radiation safety requirements in applicable technical publications.

*b.* Users will adopt no practice and conduct no operation involving planned exposure of personnel to RF levels in excess of the applicable maximum permissible exposures in DODI 6055.11.

c. Routine use of RF protective clothing to protect personnel is prohibited. Protective equipment, such as electrically insulated gloves and shoes for protection against RF shock and burn, or for insulation from the ground plane, is permissible when engineering controls or procedures cannot eliminate exposure hazards and ensure compliance with induced current limits in DODI 6055.11. Users will identify, attenuate, or control potentially hazardous RF electromagnetic fields and other radiation hazards associated with Army electronic equipment by engineering design, administrative actions, or protective equipment, (in that order), or a combination thereof. Use process and engineering controls before personal protective equipment (PPE) to protect workers.

d. Proponents of RF electromagnetic radiation-emitting systems will include radiation safety requirements in technical publications about siting, operation, and maintenance of these systems.

e. See chapter 6 for accident/incident reporting requirements.

#### **4-2. Measurement and evaluation of radio frequency fields**

Use measurement procedures and techniques recommended in Institute of Electrical and Electronics Engineers (IEEE) C95.3 as basic guidance for evaluating RF hazards.

a. Commanding General, USACHPPM, will maintain records of surveys, reports, calculations, and control measures for each type-classified RF EMR emitter.

b. Where multiple RF EMR emitters are located in fixed arrangements, RF evaluation data will include a determination of weighted contributions from expected simultaneously operated emitters.

#### **4-3. Siting commercial telecommunications equipment on Army installations**

Guidance for siting commercial telecommunications equipment on Army installations is obtained from the Defense Information Systems Agency (DISA) Joint Spectrum Center (JSC), DSN 281-2555 or commercial 410-293-2555.

### **Chapter 5**

## **Radiation Safety Standards, Dosimetry, and Recordkeeping**

### **5-1. General**

a. *Ionizing radiation.* Personnel exposure limits in this chapter do not apply to doses or exposures due to background radiation, medical administration the individual has received, or voluntary participation in medical research programs.

b. *Personnel exposure standards.* Table 5-1 summarizes Army occupational ionizing radiation exposure standards. For Army radiation programs OCONUS, table 5-1 standards apply unless more restrictive standards are required by SOFA agreements.

c. *Area designations.*

(1) *Unrestricted area.* The dose in any unrestricted area from external sources shall not exceed 2 millirems (mrem) (0.02 millisievert (mSv)) in any 1 hour. No radiation exposure restrictions or entry requirements apply in unrestricted areas. The total dose received by a member of the general public shall not exceed the limit specified in 10 CFR 20.1301.

(2) *Restricted area.* An area, access to which is limited by the RSO for the purpose of protecting individuals against undue risks from exposure to radiation and radioactive materials. Restricted area does not include areas used as residential quarters, but separate rooms in a residential building may be set apart as a restricted area.

(3) *Radiation area.* An area, accessible to individuals, in which radiation levels could result in an individual receiving a whole body dose equivalent in excess of 5 mrem (0.05 mSv) in 1 hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates. Personnel dosimetry is required for entry.

(4) *High radiation area.* An area, accessible to individuals, in which radiation levels could result in an individual receiving a whole-body dose equivalent in excess of 100 mrem (1 mSv) in 1 hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates. Personnel dosimetry and an appropriate radiation survey meter are required for entry.

(5) *Very high radiation area.* An area, accessible to individuals, in which radiation levels could result in an individual receiving a whole-body absorbed dose in excess of 500 rads (5 grays (Gy)) in 1 hour at 1 meter from a radiation source or from any surface that the radiation penetrates. Personnel dosimetry and an appropriate radiation survey meter are required for entry. Entry requires authorization by the official responsible for the area.

(6) *Contamination area.* See paragraph 5-2 for further explanation.

d. *Dosimetry.* All occupationally exposed personnel will wear dosimetry supplied by the Army Dosimetry Center (ADC). The ADC whole-body dosimeter should be worn closest to the source of radiation exposure on the trunk between the shoulders and waist. Wear supplemental dosimeters as necessary to monitor exposures to specific organs or areas, such as the thyroid, finger, hand, lens of eye, and fetus or embryo. All dosimetry services used in conjunction with Army operations will be accredited by the National Voluntary Laboratory Accreditation Program (NAVLAP).

(1) Monitor, using approved dosimeters (see para 5-1d(2)), occupational exposure of all personnel working in Army facilities or on Army projects (including Army Corps of Engineers civil works projects) for—

(a) Adults likely to receive, in 1 year from sources external to the body, a dose in excess of 10 percent of any of the applicable occupational limits in table 5-1.

(b) Minors under age 18 likely to receive, in 1 year from sources external to the body, a dose in excess of 10 percent of any of the applicable limits in table 5-1.

(c) Declared pregnant workers likely to receive, during the gestation period from sources external to the body, a dose in excess of 10 percent of the applicable limits in table 5-1. Declarations shall be in accordance with 10 CFR 20. Occupational exposure of declared pregnant workers shall be reported to the NRC license RSO, including, when applicable, to the radioactive commodity license RSO.

(d) Individuals entering a radiation area, a high radiation area, or a very high radiation area.

(2) Personnel performing radiation work involving Army and Government sources will use dosimeters supplied by the ADC. Contract, including GOCO, radiation workers will use dosimetry in accordance with contract provisions. Non-GOCO contractor personnel working under provisions of an ARP may use contractor-supplied dosimetry. Army personnel working at a DOE facility may use DOE-supplied dosimetry. The RSO will ensure that dosimetry results from non-ADC providers are furnished to the ADC for archiving.

(3) ADC dosimeters may be used to monitor the exposure of other personnel and for area monitoring. Evaluate requirements for continued use of ADC dosimetry for such purposes periodically (at least annually).

(4) DA Pam 40-18 contains instructions for wearing supplemental dosimeters.

*e. Bioassay.*

(1) Monitor occupational intake of RAM and, as necessary, assess the committed effective dose equivalent (CEDE) to—

(a) Adults likely to receive, in 1 year, an intake in excess of 10 percent of applicable annual limits of intake (ALI). The ALIs for NRC-licensed RAM are in table 1, columns 1 and 2, 10 CFR 20, appendix B. The Army RSO will approve ALIs and related air and water concentrations for radioisotopes proposed for use under ARA authority and not listed in 10 CFR 20.

(b) Minors and declared pregnant women likely to receive, in 1 year, a CEDE in excess of 50 mrem (0.5 mSv).

(2) Intake of RAM may be monitored and the CEDE assessed for other individuals. Evaluate the requirement for continued intake monitoring periodically (at least annually).

(3) All Government- and contractor-provided bioassays will be in accordance with procedures in ANSI N13.30.

*f. Dosimetry and bioassay records.*

(1) All personnel will complete DD Form 1952 (Dosimeter Application and Record of Occupational Radiation Exposure) before receiving ADC dosimetry or participating in a routine bioassay program.

(2) The RSO will provide a copy of determinations of administrative doses, determinations of non-Army occupational dose histories (obtained from other than ADC), bioassay results, and results of assessing CEDE by bioassay or by determination of the time-weighted air concentrations to which an individual has been exposed (that is, derived air concentration (DAC)-hours) to the ADC for archiving.

(3) The RSO or dosimetry custodian will provide a copy of each calendar year ADR for routinely monitored personnel to the supporting medical treatment facility or occupational health clinic (see AR 40-66). (Examples: A visitor on a short-term visit of a few days is not routinely monitored. A student or intern monitored over a period of a few months is routinely monitored.)

*g. Administrative doses.*

(1) Only the radiological hygiene consultant to TSG may approve assigning an administrative dose in place of any ADC recorded occupational dose equivalent that exceeds a table 5-1 limit.

(2) RSOs shall estimate total effective dose equivalent (TEDE) or CEDE when they cannot determine it from dosimetry or bioassay (for example, if a dosimeter was lost, damaged, or believed to be deliberately exposed). (RSOs may seek professional assistance from fellow RSOs or health physicists, as necessary). The estimate of the administrative dose may be based on any of the following:

(a) Occupancy or workload information and radiation dose levels at the radiation source operator location.

(b) Data supplied by a supplemental dosimeter.

(c) Average of the individual's previous occupational dose for the preceding 6 to 12 months if conditions prevailed similar to those during the period for which the dose is being estimated.

(d) Recorded doses accrued by coworkers performing similar duties under similar circumstances.

(e) Established doses for specific unit, duty position, and mission.

(3) The RSO will document the reason for the administrative dose assignment and the method used to estimate it.

(a) For suspected overexposures (in excess of table 5-1 limits), the RSO will forward request for approval of the administrative dose, with supporting documentation, through command channels to the radiological hygiene consultant Office of The Surgeon General (OTSG), with copy furnished to the Army RSO.

(b) For all other administrative dose assignments, the RSO will provide a report to Chief, ADC, to be included with the person's records in the central dosimetry records repository (CDRR).

*h. Emergency workers.* Emergency events involving ionizing radiation exposure could result in doses exceeding the routine occupational limits. Absent incident-specific guidance, the emergency worker limits of table 5-1 apply. Emergency exposure is expected to be once-in-a-lifetime event, and does not accrue to routine occupational exposure. Before employing emergency dose limits, on-scene leadership shall consider the risks and benefits of the increased radiation exposure. Workers should be selected on the basis of their experience in performing the emergency task, and from among those with low lifetime accumulated dose. Use of pregnant or potentially pregnant workers for tasks involving emergency dose limits should be avoided.

*i. Non-U.S. dosimeter results.* All doses recorded and reported from wear of non-U.S. dosimeters by Army personnel (for example, dosimeters furnished by coalition allies) will be reviewed by the unit, local, garrison, DRU, or ASCC RSSO and forwarded to the Army Dosimetry Center for inclusion in the dosimetry record. All doses above the limits of table 5-1 will be reviewed by TSG prior to inclusion in the dosimetry record. The ADC may annotate the record accordingly when dosimetry techniques or devices appear to non-conform to consensus standards.

*j. Other requirements.*

(1) *Nuclear Regulatory Commission jurisdiction.* Standards for exposure to ionizing radiation emitted from NRC-licensed radioactive materials are in 10 CFR 20. The Army also applies these standards to Army reactors and to a combination of exposures to NRC-licensed radioactive material and other ionizing radiation sources through the requirements of this pamphlet.

(2) *Occupational Safety and Health Administration jurisdiction.* Federal standards for occupational exposure to all other ionizing radiation sources are in OSHA regulations (see 29 CFR 1910.1096 and 1926.53). See OSHA Directive, CPL 02-00-086 - CPL 2.86 - Memorandum of Understanding between the OSHA and the NRC, 22 December 1989, for a delineation of radiation sources regulated by each agency. However, adhere to the standards of this pamphlet for all ionizing radiation sources when these standards are more protective than OSHA standards.

(3) Federal requirements for security of radioactive material; control of access to radiation areas, high radiation areas, and very high radiation areas; caution signs; posting and labeling requirements; radioactive material shipping and receiving; are cited in 10 CFR, 29 CFR 1910.1096 and 1926.53, 49 CFR, and other applicable documents (see app A). Commanders may waive posting and labeling requirements during deployments and contingency operations on the basis of a risk assessment. Host nation regulations and SOFA requirements must be considered in the waiver analysis.

## 5-2. Radioactive contamination

American National Standards Institute (ANSI) N13.12 is to be used when available. In the absence of other regulatory or advisory guidance, a surface is contaminated if either the removable or total radioactivity is above the levels in table 5-2.

*a.* If a surface cannot be decontaminated promptly to levels below those in table 5-2, control, mark, designate, or post it per applicable regulations. Report the contaminated surface to the appropriate RSO.

*b.* Always reduce radioactive contamination to levels as low as reasonably achieved (ALARA) (see glossary).

*c.* Local commanders/directors may use contamination standards more restrictive than those in table 5-2 but will not use standards less restrictive without applying CRM principles (see para 1-10).

*d.* Guidance on radioactive contamination release criteria for decommissioned facilities is available in NUREG 1757.

*e.* As a general practice, Army organizations will not release volume-contaminated materials or items for unrestricted use. Screening levels for volume-contaminated materials are specified by, or negotiated with, the regulator. For volume-contaminated materials not otherwise subject to regulatory control, screening levels for unrestricted release of items or materials potentially contaminated in volume require approval of the Army RSO.

## 5-3. Non-ionizing radiation

See table 5-3 for a description of the electromagnetic radiation spectrum. Refer to the following indicated references for personnel radiation exposure standards for the following types of non-ionizing radiation.

*a.* LASERS — ANSI Z136.1 ANSI Z136.3, and ANSI Z136.6, TB Med 524.

*b.* Ultraviolet, visible, and infrared — American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) for Chemical Substances and Physical Agents and Biological Exposure Indices.

*c.* Radio frequency electromagnetic radiation — DODI 6055.11 for 3 kHz - 300 GHz; IEEE Standard C95.6 for 0 - 3 kHz.

*d.* Static magnetic fields — IEEE Standard for Safety Levels with Respect to Human Exposure to Electromagnetic Fields, 0-3 kHz.

*e.* Suspected LASER eye injuries — Immediately evacuate personnel suspected of experiencing potentially damaging eye exposure from LASER radiation to the nearest medical facility for an eye examination (OTSG Policy, 11 April 1994). LASER eye injuries require immediate specialized ophthalmologic care to minimize long-term visual acuity

loss. Medical personnel should obtain medical guidance for LASER injuries from the Tri-Service LASER Incident Hotline, (800) 473-3549, DSN 240-4784, 210-536-4784 (during non-duty hours call 210-536-3278).

**Table 5-1**  
**Army personnel ionizing radiation exposure standards<sup>1</sup>.**

Category	Maximum <sup>2,3</sup>
Member of the general public	100 mrem (1 mSv) (TEDE) in calendar year <sup>4</sup>
Fetus/embryo of occupationally exposed declared pregnant woman	500 mrem (5 mSv) (DDE of mother + ED due to radionuclides in fetus/embryo) for gestation period, not to exceed 50 mrem/month.
Occupational exposure of adults	5 rem (0.05 Sv) (TEDE) in calendar year
Lens of the eye	15 rem (0.15 Sv) (EDE) in calendar year <sup>3</sup>
Individual organ	50 rem (0.5 Sv) (DDE + CDE) in calendar year
Skin or extremity	50 rem (0.5 Sv) (SDE) in calendar year
Occupational exposure of minors under age 18	0.5 rem (0.005 Sv) TEDE in a calendar year
Emergency worker - non lifesaving	5 rem <sup>5</sup>
Emergency worker - lifesaving	25 rem <sup>6</sup>
Emergency worker - lifesaving	50 rem <sup>7</sup>

Notes:

<sup>1</sup> From 10 CFR 20. Refer to 10 CFR 20 for detailed standards. For deployment and combat actions, see also JP 3-11.

<sup>2</sup> Abbreviations: TEDE=total effective dose equivalent; DDE=deep dose equivalent; ED=effective dose; EDE=effective dose equivalent; CDE=committed dose equivalent; SDE=shallow dose equivalent.

<sup>3</sup> OSHA standard for occupational exposure of adults and for the lens of the eye is 1¼ rem in calendar quarter. OSHA standard for skin of whole body is 7½ rem in calendar quarter. OSHA standard for hands and forearms; feet and ankles is 18¾ rem in calendar quarter.

<sup>4</sup> The dose in any unrestricted area from external sources, exclusive of the dose contributions from patients administered radioactive material and released in accordance with applicable regulations, will not exceed 2 mrem (0.02 mSv) in any one hour.

<sup>5</sup> Emergency radiation exposure to incident responders should be controllable to this limit in almost all situations. The on-scene commander may increase the limit when all reasonable dose-limiting actions have been employed, and increased dose is unavoidable.

<sup>6</sup> Only on a voluntary basis where a lower dose limit is not practicable.

<sup>7</sup> Only on a voluntary basis where a lower dose limit is not practicable, and only to personnel fully aware of the risks involved, including a substantial increase in their lifetime cancer risk.

**Table 5-2**  
**Screening levels for clearance**

Radionuclide Groups <sup>(a)</sup>	Screening Levels (S.I. Units) <sup>(b)</sup>	Surface Screening (Conventional Units) <sup>(b)</sup>
	(Bq/cm <sup>2</sup> or Bq/g) <sup>(c)</sup>	(dpm/100 cm <sup>2</sup> )
<b>Group 1</b> Radium, Thorium, and Transuranics: <sup>210</sup> Po, <sup>210</sup> Pb, <sup>226</sup> Ra, <sup>228</sup> Ra, <sup>228</sup> Th, <sup>230</sup> Th, <sup>232</sup> Th, <sup>237</sup> Np, <sup>239</sup> Pu, <sup>240</sup> Pu, <sup>241</sup> Pu, <sup>244</sup> Am, <sup>244</sup> Cm, and associated decay chains <sup>(d)</sup> , and others <sup>(a)</sup>	0.1	600
<b>Group 2</b> Uranium and Selected High Dose Beta-Gamma Emitters: <sup>22</sup> Na, <sup>54</sup> Mn, <sup>58</sup> Co, <sup>60</sup> Co, <sup>65</sup> Zn, <sup>90</sup> Sr, <sup>94</sup> Nb, <sup>106</sup> Ru, <sup>110</sup> mAg, <sup>124</sup> Sb, <sup>134</sup> Cs, <sup>137</sup> Cs, <sup>152</sup> Eu, <sup>154</sup> Eu, <sup>192</sup> Ir, <sup>234</sup> U, <sup>235</sup> U, <sup>238</sup> U, Natural Uranium <sup>(e)</sup> , and others <sup>(a)</sup>	1	6,000
<b>Group 3</b> General Beta-Gamma Emitters: <sup>24</sup> Na, <sup>36</sup> Cl, <sup>59</sup> Fe, <sup>109</sup> Cd, <sup>131</sup> I, <sup>129</sup> I, <sup>144</sup> Ce, <sup>198</sup> Au, <sup>241</sup> Pu, and others <sup>(a)</sup>	10	60,000



**Table 5-2**  
**Screening levels for clearance—Continued**

<b>Group 4<sup>(f)</sup></b> Other Beta-Gamma Emitters: <sup>3</sup> H, <sup>14</sup> C, <sup>32</sup> P, <sup>35</sup> S, <sup>45</sup> Ca, <sup>51</sup> Cr, <sup>55</sup> Fe, <sup>63</sup> Ni, <sup>89</sup> Sr, <sup>99</sup> Tc, <sup>111</sup> In, <sup>125</sup> I, <sup>147</sup> Pm, and others <sup>(a)</sup>	100	600,000
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Legend for Table 5-2:

(a) To determine the specific group for radionuclides not shown, a comparison of the effective dose factors, by exposure pathway, listed in Table A.1 of NCRP Report No. 123 (NCRP 1996) for the radionuclides in question and the radionuclides in the general groups above shall be performed and a determination of the proper group made, based on similarity of the factors.

(b) Rounded to one significant figure.

(c) The screening levels shown are used for either surface activity concentration (in units of Bq/cm<sup>2</sup>), or volume activity concentration (in units of Bq/g). These groupings were determined based on similarity of the scenario modeling results, as described in Annex B.

(d) For decay chains, the screening levels represent the total activity (i.e., the activity of the parent plus the activity of all progeny) present.

(e) Where the Natural Uranium activity equals 48.9% from <sup>238</sup>U, plus 48.9% from <sup>234</sup>U, plus 2.25% from <sup>235</sup>U.

(f) Radionuclides were assigned to groups that were protective of 10 µSv/y (1.0 mrem/y) and were limited to 4 groups for ease of application, as discussed in Annex B.

**Table 5-3**  
**Electromagnetic radiation**

Region	Wavelength <sup>1</sup>	Frequency <sup>1</sup>	Authority <sup>2</sup>
Ionizing (gamma and x rays)	less than 100 nm	less than 3 PHz ( <i>E</i> less than 12.4 eV)	NRC, OSHA Army
Ultraviolet (UV)	100 to 400 nm	0.75–0.79 to 3 PHz	CIE/FDA
Visible (light)	400 to 780 nm	390 to 790 THz	CIE/FDA
Infrared (IR)	780 nm to 1 mm	300 GHz to 390 THz	CIE/FDA
Radio frequency	1 mm to 100 km	3 kHz to 300 GHz	DOD
Extremely low frequency	less than 100 km	more than 3 kHz	IEEE
Static electric fields	NA	NA	IEEE

Notes:

<sup>1</sup> Wavelength x frequency=speed of light=3 x 10<sup>8</sup> m s<sup>-1</sup>.

<sup>2</sup> The regulating authority for personnel exposure for the purposes of this pamphlet (see para 5-4).

Static electric fields	NA	NA	IEEE
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Legend for Table 5-3:

†Unit abbreviations: nm=nanometer (10<sup>-9</sup> m); m=micrometer (10<sup>-6</sup> m); mm=millimeter (10<sup>-3</sup> m); km=kilometer (10<sup>3</sup> m); PHz=petahertz (10<sup>15</sup> Hz); THz=terahertz (10<sup>12</sup> Hz); GHz = gigahertz (10<sup>9</sup> Hz); kHz=kilohertz (10<sup>3</sup> Hz); and eV=electron volt (1 eV = 1.6 x 10<sup>-19</sup> J).

## Chapter 6

### Special Reporting Requirements

#### 6-1. General

a. Reporting requirements of NRC licenses, 10 CFR, AR 40-5, AR 385-10, DA Pam 385-40, and DA Pam 40-18 apply for radiation accidents, incidents, and overexposures. Incidents or accidents involving—

(1) *Radioactive material*. Reported immediately to the NRC license holder (see table 6-1), ARA holder and ARP issuer.

(2) *Manufactures electronics product*. For example, x-ray device.

(a) Where reasonable grounds exist that an incident has occurred, personnel are encouraged to remain calm, shut off the device, and call the following numbers at USACHPPM to report all medical and industrial incidents involving electronic products:

1. DSN 584-3502 or commercial (410) 436-3502 or after duty hours at (410) 436-4375 or (800) 222-9698 (24 hour phone lines).

2. Refer to the USACHPPM Web site <http://chppm-www.apgea.army.mil/> under Occupational Health Services until medical attention is obtained and the incident is reported to the ARA holder.

(b) Report the incident to Army HQ (ACOM, ASCC, DRU), DASAF and to the Center for Devices and Radiological Health, FDA (21 CFR 1002).

(3) *Non-ionizing radiation*.

(a) Suspected eye injuries — LASER eye injuries require immediate specialized ophthalmologic care to minimize long term visual acuity loss. Medical personnel should obtain medical guidance for such emergencies from the Tri-Service LASER Incident Hotline (DSN 240-4784 or commercial (210) 536-4784 or (800) 473-3549 (24-hour phone line)) (e-mail laser.safety@brooks.af.mil).

(b) Report all non-ionizing incidents or accidents to—

1. Commander, USACHPPM, 5158 Blackhawk Road, Aberdeen Proving Ground, MD 21010-5403, (800) 222-9698 (24-hour phone line).

2. USACHPPM LASER/Optical Radiation Program (LORP) (DSN 584-3932/2331 or commercial (410) 436-3932/2331 or (800) 222-9698 after duty hours) (e-mail laserincident@amedd.army.mil).

b. The NRC license holder will report applicable accidents/incidents to the appropriate NRC regional office. ARA holders and ARP issuers will report to higher commands accidents/incidents as required.

c. Notify the garrison or activity public affairs officer at the onset of the accident or incident in order to activate public affairs contingency measures (see AR 360-1). Radiation accidents or incidents attract the attention of local and national media quickly. Early disclosure of accurate information is vital to maintaining the confidence of both the internal and external public.

d. Accident notification will be completed as per AR 385-10, chapter 3. In addition, the commander experiencing a radiation accident will send an electronically transmitted message to the following addressees providing as many details of the accident as possible, in accordance with the Radiological Accident Report format in paragraph 6-3, within 24 hours of occurrence to the following addressees:

(1) Commander, USACRC (CSSC-Z), Fort Rucker, AL, at DSN 558-2660/3410, commercial (334) 255-2660/3410 (24-hour phone line), FAX DSN 558-3749, commercial (334) 255-3749 or e-mail helpdesk@crc.army.mil.

(2) Also notify (DACS-SF) The Army Safety Office at DSN 329-2412, commercial (703) 601-2412 and (SGPS-PSP) DSN 289-0132/703-756-0132 or e-mail ASO@hqda.army.mil. (during non-duty hours, contact AOC, DSN 227-0218, Commercial (703) 697-0218, and indicate the offices to be notified).

**Table 6-1**

**U.S. Army Materiel Command Nuclear Regulatory Commission commodity license radiation safety officers**

MSC	Phone number	Commodity type
AMCOM	256-303-2114	Am-241 Range Finders
AMCOM	256-303-2114	Magnesium Thorium Alloy
C-E LCMC	732-427-3112	Gauges
JMC	309-782-0338	LAW Rocket Sites
JMC	309-782-0338	DU Munitions
TACOM LCMC	309-782-2965	H3/CAD/CAM
TACOM LCMC	586-574-7635	DU in Tank Armor and Moisture Density Testers

## **6-2. Other required reporting agencies and time requirements**

a. Send information copies of all reports required by 10 CFR 20.2201 through 20.2205, 29 CFR 1910.1096(m), or 29 CFR 1926.53(o) and of any other accident or incident report to the NRC or OSHA through command channels to the Director of Army Safety, ATTN: DACS-SF, 223 23rd St., Room 980, Arlington, VA 22202.

b. Reports through command channels will meet the same time requirements, as do required reports to the NRC and OSHA. For example, if the NRC requires immediate telephonic notification, follow it with immediate telephonic notification through the chain of command to Director of Army Safety, ATTN: DACS-SF, 223 23rd St., Room 980, Arlington, VA 22202 (DSN 329-2405/2411 or commercial (703) 601-2405/2411).

## **6-3. Radiological Accident Report, RCS DD-R&E (AR) 1168**

a. The Radiological Accident Report will include the following:

(1) Date and time of event.

(2) Radiation-producing device or source involved, including national stock number (NSN), serial number, part number, radiation characteristics, and parameters of the event.

(3) Description of the event, including cause; names and SSNs of the people exposed, injured, or contaminated; estimated exposure; contamination levels; facilities effected; potential damages; impact on operations; and immediate-response actions taken.

- (4) Actions taken to prevent recurrence.
  - (5) Recommendations to avoid similar instances at other installations possessing similar material or devices.
  - (6) Name and telephone number of health physicist or radiation safety officer, field unit identification and the appropriate ACOM, ASCC, or DRU involved.
  - (7) Point of contact (name, address, and telephone number).
  - (8) A statement of when the appropriate offices in DOL, NRC, and DOT were notified (if applicable) and by whom notification was made.
  - (9) NRC License, Army authorization number, or Army permit number.
- b. Commanders will send an electronically transmitted message within 24 hours of occurrence

## **Chapter 7**

### **Training Requirements for Radiation Safety Officers, LASER Safety Officers, and Radio Frequency Safety Officers**

#### **7-1. General**

- a. the RSOs, LSOs, and RFSOs shall be trained to a level commensurate with the duties and responsibilities of the radiation program for which they are responsible, and in accordance with applicable NRC regulations and license conditions, ANSI standards, ARAs, and other program documents (including state regulations as they may apply to National Guard RSOs).
- b. This training shall be completed before the RSO/LSO assumes the Radiation Safety Program responsibility.
- c. Refresher training should occur annually and retraining should occur after a significant regulatory change or every 5 years.

#### **7-2. Formal training**

- a. An RSO designated in accordance with this pamphlet shall complete a formal course of instruction addressing the following topics:
  - (1) Basic radiation interactions.
  - (2) Radioactivity.
  - (3) Terms and units.
  - (4) Biological effects.
  - (5) Radiation detection and measurement.
  - (6) Radiation and contamination control.
  - (7) Radiation dosimetry.
- (8) In addition, the RSO shall receive specific training for Army radioactive commodities or radiation producing equipment for which he/she is responsible.
- b. Acceptable courses for unit and garrison radiation safety officers are offered by the U.S. Army Chemical School, MEDCOM, NGB, and Army Materiel Command licensees.
- c. An RFSO with responsibility for a non-ionizing Radiation Safety Program (other than a LASER program) shall complete a formal course of instruction addressing such topics as RF radiation, terminology, biological effects, and exposure control measures. An acceptable course is offered by the USACHPPM.
- d. Any individual who certifies radioactive shipments must complete training required by 49 CFR 173.1(b).
- e. An LSO designated in accordance with this pamphlet shall complete a formal course of instruction addressing the such topics as LASER fundamentals, terminology, biological effects, hazard analysis, protective and control measures. Acceptable courses are offered by the USACHPPM, and the Laser Institute of America.
- f. Unit RSO's for units that possess only chemical detection equipment, fire control devices or generally licensed equipment may be trained through TRADOC, NGB, locally, AMC licensees, or through the use of computer based training modules. This training must be documented and provide an understanding of the hazards of the material, appropriate control measures, and necessary accident/incident response actions and/or notifications.

## **Appendix A**

### **References**

#### **Section I**

##### **Required Publications**

###### **AR 40-5**

Preventive Medicine. (Cited in paras 1-4e, 1-4q, 2-7f, 6-1a.)

###### **AR 40-10**

Health Hazard Assessment Program (HHA) in Support of the Army Materiel Acquisition Decision Process. (Cited in para 1-4g(4).)

###### **AR 50-7**

Army Reactor Program. (Cited in paras 1-6b, 2-3c.)

###### **AR 385-10**

The Army Safety Program (Cited in paras 1-1, 1-4, 1-4c, 1-4d, 1-4e, 1-4f, 1-4k, 2-4, 6-1a, 6-1c.)

###### **AR 710-3**

Asset and Transaction Reporting System (Cited in para 1-4r.)

###### **AR 750-43**

Army Test Measurement and Diagnostic Equipment (Cited in para 1-4c.)

###### **DA Pam 385-30**

Mishap Risk Management (Cited in para 1-4c.)

###### **DA Pam 385-40**

Accident Reporting and Investigation. (Cited in paras 1-4k, 6-1a.)

###### **DA Pam 40-18**

Personnel Dosimetry Guidance and Dose Recording Procedures for Personnel Occupationally Exposed to Ionizing Radiation. (Cited in paras 1-4f, 1-4i, 5-2c, 6-1a.)

###### **DOD 4160.21-M-1**

Defense Demilitarization Manual. (Cited in paras 1-4i, 3-2c.) (Available at <http://www.dtic.mil/whs/directives/>.)

###### **DOD 4500.9-R (Part II)**

Defense Transportation Regulation - Cargo Movement. (Cited in para 2-6b.) (Available at <http://www.dtic.mil/whs/directives/>.)

###### **DODI 6055.11**

Protection of DOD Personnel from Exposure to Radio frequency Radiation and Military Exempt Lasers. (Cited in paras 1-4f, 1-4k, 4-1a, 4-1b, 4-1c, 5-3c.) (Available at <http://www.dtic.mil/whs/directives/>.)

###### **FM 5-19**

Composite Risk Management. (Cited in paras 1-4c, 1-4i.)

###### **TB 750-25**

Maintenance of Supplies and Equipment: Army Test, Measurement, and Diagnostic Equipment (TMDE) Calibration and Repair Support (C&RS) Program. (Cited in paras 1-4c, 2-8.)

###### **TB MED 524**

Control of Hazards to Health from Laser Radiation. (Cited in paras 3-1d, 5-3a.)

###### **10 CFR 19**

Notices, instructions and reports to workers: inspection and investigations. (Cited in para 1-4d(2)(d).) (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**10 CFR 20**

Standards for protection against radiation (Cited in paras 5–1*d*(1)(c), 5–1*e*(1)(a), 5–1*j*(1).) (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**10 CFR 30**

Rules of general applicability to domestic licensing of byproduct material. (Cited in para 2–3*d*.) (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**10 CFR 31**

General domestic licenses for by-product material (Cited in para 2–3*c*(1).) (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**10 CFR 40**

Domestic licensing of source material. (Cited in para 2–3*c*(1).) (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**10 CFR 70**

Domestic licensing of special nuclear material. (Cited in para 2–3*c*(1).) (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**10 CFR 71**

Packaging and transportation of radioactive material. (Cited in para 2–6*a*(2).) (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**21 CFR**

Food and Drugs (Cited in para 3–1*a*.) (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**29 CFR**

Labor. (Cited in para 4–1*e*.) (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**32 CFR 655**

Radiation Sources on Army Land. (Cited in para 2–4.) (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**40 CFR**

Environmental Protection Agency. (Cited in para 2–1*e*.) (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**49 CFR**

Department of Transportation. (Cited in paras , 1–4*c*(2), 5–2*j*.) (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**Section II****Related Publications**

A related publication is a source of additional information. The user does not have to read it to understand this pamphlet.

**AR 11–2**

Management Control

**AR 11–34**

The Army Respiratory Protection Program

**AR 25–400–2**

The Army Records Information Management System (ARIMS)

**AR 40–13**

Medical Support-Nuclear/Chemical Accidents and Incidents

**AR 40–66**

Medical Record Administration

**AR 50–5**

Nuclear Surety

**AR 70-1**

Army Acquisition Policy

**AR 70-6**

Management of the Research, Development, Test and Evaluation, Army Appropriation

**AR 190-54**

Severity of Nuclear Reactors and Special Nuclear Materials

**AR 200-1**

Environmental Protection and Enhancement

**AR 200-2**

Environmental Effects of Army Actions.

**AR 360-1**

Army Public Affairs Program

**AR 385-63**

Range Safety

**AR 725-50**

Requisitioning, Receipt, and Issue System

**AR 735-5**

Policies and Procedures for Property Accountability

**DA Pam 40-18**

Personnel Dosimetry Guidance & Dose Recording Procedures for Personnel Occupationally Exposed to Ionizing Radiation

**DA Pam 50-5**

Nuclear Accident or Incident Response and Assistance (NAIRA) Operations

**DA Pam 70-1**

Army Acquisition Policy

**DA Pam 385-10**

Army Safety Program

**DA Pam 385-16**

System Safety Management

**DA Pam 385-63**

Range Safety

**ANSI N13.12**

Surface and Volume Radioactivity Standards for Clearance. (This publication may be obtained from American National Standards Institute, 1430 Broadway, New York, NY 10018.)

**ANSI N13.30**

American National Standards Institute, Performance Criteria for Radiobioassay. (This publication may be from American National Standards Institute, 1430 Broadway, New York, NY 10018.)

**ANSI N43.1**

Radiological Safety in the Design and Operation of Particle Accelerators. (The National Bureau of Standards is now known as the National Institute of Standards and Technology.) (This publication may be obtained from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036.)

**ANSI N43.2**

Radiation Safety for x-ray Diffraction and Fluorescence Analysis Equipment (This publication may be obtained from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036.)

**ANSI N43.3**

General Radiation Safety Standard for Installations Using Non-Medical X-Ray and Sealed Gamma-Ray Sources, Energies up to 10 MeV. (This publication may be obtained from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036.)

**ANSI N43.17–2002**

American National Standards Institute, American National Standard for Radiation Safety for Personnel Security Screening Systems Using X-rays. (This publication may be obtained from American National Standards Institute, 1430 Broadway, New York, NY 10018.)

**ANSI N323**

American National Standards Institute, Radiation Protection Instrumentation Test and Calibration. (This publication may be obtained from American National Standards Institute, 1430 Broadway, New York, NY 10018.)

**ANSI Z136.1**

American National Standards Institute, American National Standard for Safe Use of Lasers. (This publication may be obtained from the LASER Institute of America, Suite 125, 2424 Research Parkway, Orlando, FL 32826.)

**ANSI Z136.3**

American National Standards Institute, American National Standard for the Safe Use of Lasers in Health Care Facilities. (This publication may be obtained from the LASER Institute of America, Suite 125, 2424 Research Parkway, Orlando, FL 32826.)

**ANSI Z136.6**

American National Standards Institute, American National Standard for the Safe Use of Lasers Outdoors. (This publication may be obtained from the LASER Institute of America, Suite 125, 2424 Research Parkway, Orlando, FL 32826.)

**AST–1500Z–100–93**

Identification Guide for Radioactive Sources in Foreign Materiel. (This publication is available from Commander, U.S. Army Foreign Science and Technology Center, ATTN: IAFSTC–PO, 220 Seventh St. NE, Charlottesville, VA 22901–5396.)

**DLAI 4145.8/NAVSUPINST 4000.34C/AFJI 23–504/MCO P4400.105**

Material Management for radioactive Items in the DOD. (Available at <http://www.dla.mil/dlaps/dlai>.)

**DODI 6055.8**

Occupational Radiation Protection Program (Available at <http://www.dtic.mil/whs/directives/>.)

**DODI 6055.15**

DOD Laser Protection Program. (Available at <http://www.dtic.mil/whs/directives/>.)

**FM 5–0**

Army Planning and Orders Production

**FM 8–50**

Prevention and Medical Management of Laser Injuries

**IEEE C95.1**

Institute of Electrical and Electronics Engineers, Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz. (This publication may be obtained from the Institute of Electrical and Electronics Engineers, Inc., 345 East 47th St., New York, NY 10017.)

**IEEE C95.6**

Institute of Electrical and Electronics Engineers, Standard for Safety Levels with Respect to Human Exposure to Electromagnetic Fields, 0–3 kHz. (This publication may be obtained from the Institute of Electrical and Electronics Engineers, Inc., 345 East 47th St., New York, NY 10017.)

**IEEE C95.3**

Institute of Electrical and Electronics Engineers, Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields- RF and Microwave. (This publication may be obtained from the Institute of Electrical and Electronics Engineers, Inc., 345 East 47th St., New York, NY 10017.)

**IEEE C95.7**

Institute of Electrical and Electronics Engineers, Recommended L17 Practice for Radio Frequency Safety Programs, 3 kHz to 300 GHz. (This publication may be obtained from the Institute of Electrical and Electronics Engineers, Inc., 345 East 47th St., New York, NY 10017.)

**Joint Publication 3–11**

Joint Doctrine for Operations in Nuclear, Biological, and Chemical (NBC) Environments. (Available at <http://www.dtic.mil/whs/directives/>.)

**MARSSIM**

Multi-Agency Radiation Survey and Site Investigation Manual. (Available at <http://www.marssim.com>.)

**MIL–HDBK–828a**

LASER Range Safety in Ranges and Other Outdoor Areas. (This publication may be obtained from the Standardization Documents Order Desk, Building 4D, 700 Robbins Ave., Philadelphia, PA 19111–5094.)

**MIL–STD–129**

Military Marking for Shipping and Storage. (Available at <http://www.wbdg.org/>.)

**NRC Regulatory Guide 8.10**

Operating Philosophy for Maintaining Occupational Exposures As Low As reasonably Achievable. (Available at <http://www.nrc.gov/>.)

**NRC Regulatory Guide 8.13**

Instruction Concerning Prenatal Radiation Exposure. (Available at <http://www.nrc.gov/>.)

**NRC Regulatory Guide 8.29**

Instruction Concerning Risks from Occupational Radiation Exposure. (Available at <http://www.nrc.gov/>.)

**NCRP Report 123**

Screening Models for Releases of Radionuclides to the Atmosphere, Surface Water and Ground. (Available at <http://www.nrc.gov/>.)

**NUREG 1505, Rev 1**

A Nonparametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys. (This publication may be obtained from the U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20013–7082, or from the National Technical Information Service, 5258 Port Royal Rd., Springfield, VA 22161.)

**NUREG 1507**

Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminates and Field Conditions. (This publication may be obtained from the U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20013–7082, or from the National Technical Information Service, 5258 Port Royal Rd., Springfield, VA 22161.)

**NUREG 1556**

Consolidated Guidance about Materials Licenses, Volumes 1 - 20. (This publication may be obtained from the U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20013–7082, or from the National Technical Information Service, 5258 Port Royal Rd., Springfield, VA 22161.)



**NUREG 1757**

Consolidated NMSS Decommissioning Guidance. (This publication may be obtained from the U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20013-7082, or from the National Technical Information Service, 5258 Port Royal Rd., Springfield, VA 22161.)

**OSHA Directive, CPL 02-00-086 – CPL 2.86 – Memorandum of Understanding between the OSHA and the NRC, 22 December 1989**

Subject: Delineation of radiation sources regulated by each agency. (Available at <http://www.osha.gov>.)

**OSHA 1910.1096**

Toxic and Hazardous Substances-Ionizing radiation. (Available at <http://www.osha.gov>.)

**OTSG Policy Memo, dated 11 April 1994**

Subject: Surveillance of Laser and Radio frequency Radiation Personnel. (Available at <http://chppm-www.apgea.army.mil/>.)

**Public Law 93-438**

Energy Reorganization Act of 1974. (Available at <http://www.gpoaccess.gov/plaws/index.html>.)

**TB 9-6665-285-15**

Army Calibration Program for RADIAC Meters. (Available at <http://www.nlm.nih.gov/pubs/techbull/>.)

**TB 43-0116**

Identification of Radioactive Items in the Army. (Available at <http://www.nlm.nih.gov/pubs/techbull/>.)

**TB 43-0122**

Identification of CECOM Radioactive Commodities. (Available at <http://www.nlm.nih.gov/pubs/techbull/>.)

**TB 43-0133**

Hazard Controls for CECOM Radio frequency and Optical Radiation Producing Equipment. (Available at <http://www.nlm.nih.gov/pubs/techbull/>.)

**TB 43-0137**

Transportation Information for U.S. Army Radioactive Commodities. (Available at <http://www.nlm.nih.gov/pubs/techbull/>.)

**TB 43-0180**

Calibration and Repair Requirements for the Maintenance of Army Materiel. (Available at <http://www.nlm.nih.gov/pubs/techbull/>.)

**TB 43-0197**

Instructions for Safe Handling, Maintenance, Storage, and Disposal of Radioactive Items licensed by TACOM. (Available at <http://www.nlm.nih.gov/pubs/techbull/>.)

**TB 43-0216**

Safety and Hazard Warnings for Operation and Maintenance of TACOM Equipment. (Available at <http://www.nlm.nih.gov/pubs/techbull/>.)

**TB 43-0255**

Disposition/Disposal Information for CECOM Radioactive Commodities. (Available at <http://www.nlm.nih.gov/pubs/techbull/>.)

**TB 385-4**

Safety Requirements for Maintenance of Electrical and Electronic Equipment. (Available at <http://www.nlm.nih.gov/pubs/techbull/>.)

**TB MED 502**

Respiratory Protection Program. (Available at <http://chppm-www.apgea.army.mil/tbm.htm>.)

**TB MED 521**

Management and Control of Diagnostic, Therapeutic, and Medical Research X-Ray Systems and Facilities. (Available at <http://chppm-www.apgea.army.mil/tbm.htm>.)

**TB MED 522**

Control of Health Hazards from Protective Material Used in Self-Luminous Devices. (Available at <http://chppm-www.apgea.army.mil/tbm.htm>.)

**TB MED 523**

Control of Hazards to Health from Microwave and Radio Frequency Radiation and Ultrasound. (Available at <http://chppm-www.apgea.army.mil/tbm.htm>.)

**TB MED 525**

Control of Hazards to Health from Ionizing Radiation Used by the Army Medical Department. (Available at <http://chppm-www.apgea.army.mil/tbm.htm>.)

**TM 3-261**

Handling and Disposal of Unwanted Radioactive Material. (Available at <http://www.usace.army.mil/usace-docs/armytm/>.)

**TM 5-805-12**

X-Ray Shielding. (Available at <http://www.usace.army.mil/usace-docs/armytm/>.)

**TR 94-11**

Radiation Protection Information for the Safe Handling of Tritium Sources in Radioluminescent Devices. (Available at <http://www.monmouth.army.mil/cecom/safety/radiation/rpublication.htm>.)

**10 CFR Chapter 1**

Nuclear Regulatory Commission. (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**10 CFR 19.13**

Notices, instructions and reports to workers: inspection and investigations-notifications and reports to individuals. (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**10 CFR 20.1301**

Standards for protections against radiation-Dose limits for individual members of the public. (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**10 CFR 20.1501**

Standards for protection against radiation-General (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**10 CFR 20.2106**

Standards for protection against radiation-Records of individual monitoring results (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**10 CFR 20.2110**

Standards for protection against radiation-Form of records. (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**10 CFR 20.2201**

Standards for protection against radiation-Reports of theft or loss of licensed material. (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**10 CFR 20.2205**

Standards for protection against radiation-Reports of individuals of exceeding dose limits. (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**10 CFR 20.2206**

Standards for protection against radiation-Reports of individual monitoring. (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**10 CFR 30.5**

Rules of general applicability to domestic licensing of by-product material-Interpretations. (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**10 CFR 30.14**

Rules of general applicability to domestic licensing of byproduct material-Exempt concentrations. (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**10 CFR 30.18**

Rules of general applicability to domestic licensing of by-product material-Exempt quantities. (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**10 CFR 30.20**

Rules of general applicability to domestic licensing of by-product material-Gas and aerosol detectors containing by-product material. (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**10 CFR 30.35(g)**

Rules of general applicability to domestic licensing of by-product material-Financial assurance and recordkeeping for decommissioning. (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**10 CFR 40.13**

Domestic licensing of source material-Unimportant quantities of source material. (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**10 CFR 40.36**

Domestic licensing of source material-Financial assurance and recordkeeping for decommissioning. (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**10 CFR 70.19**

Domestic licensing of special nuclear material-General license for calibration or reference sources. (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**10 CFR 70.25**

Domestic licensing of special nuclear material- Financial assurance and recordkeeping for decommissioning. (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**10 CFR 150.20**

Exemptions and continued regulatory authority in Agreement States and in offshore waters under section 274-Recognition of Agreement State licenses. (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**10 CFR 835**

Occupational Radiation Protection. (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**10 CFR Appendix B**

Annual Limits on Intake (ALIs) and Derived Air Concentrations (DACs) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage. (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**21 CFR 1002**

Food and Drugs-Records and reports. (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**21 CFR 1040**

Performance standards for light-emitting products. (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**21 CFR 1040.10**

Performance standards for light-emitting products-LASER products. (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**21 CFR 1040.11**

Performance standards for light-emitting products-Specific purpose LASER products. (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**29 CFR 1910.1096**

Occupational Safety and Health Standards-Ionizing radiation. (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**29 CFR 1926.53**

Safety and health regulations for construction-Ionizing radiation. (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**29 CFR Subchapter J**

Radiological Health. (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**49 CFR 173.1**

Shippers-general requirements for shipments and packagings-Purpose and scope. (Available at <http://www.gpoaccess.gov/cfr/index.html>.)

**Section III****Prescribed Forms**

This section contains no entries.

**Section IV****Referenced Forms**

Unless otherwise indicated, DA Forms are available on the APD Web site (<http://www.apd.army.mil>) and DD Forms are available on the OSD Web site (<http://www.dtic.mil/whs/directives/infomgt/forms/formsprogram.htm>).

**DA Form 11-2-R**

Management Control Evaluation Certification Statement (Available through normal forms supply channels.)

**DA Form 285-AB-R**

U.S. Army Abbreviated Ground Accident Report (Available through normal forms supply channels.)

**DA Form 3337**

Application for Army Radiation Authorization or Permit

**DA Form 2028**

Recommended Changes to Publications and Blank Forms

**DD Form 1952**

Dosimeter Application and Record of Occupational Radiation Exposure

**NRC Form 241**

Report of Proposed Activities in Non-Agreement States, Areas of Exclusive Federal Jurisdiction or Offshore Waters (Available at <http://www.nrc.gov>.)

## **Glossary**

### **Section I Abbreviations**

#### **ABHP**

American Board of Health Physics

#### **ACGIS**

American Conference of Governmental Industrial Hygienist

#### **ACOM**

Army Command

#### **ACSIM**

Assistant Chief of Staff for Installation Management

#### **ADR**

Automated Dosimetry Report

#### **AFB**

United States Air Force Base

#### **ADC**

Army Dosimetry Center

#### **ALARA**

as low as is reasonably achievable

#### **ALI**

annual limit of intake

#### **AMC**

U.S Army Materiel Command

#### **ANSI**

American National Standards Institute

#### **APD**

Army Publishing Directorate

#### **AR**

Army regulation

#### **ARA**

Army radiation authorization

#### **ARIMS**

Army Records Information Management System

#### **ARP**

Army radiation permit

#### **ARSC**

Army Radiation Safety Council

#### **ARSO**

Army radiation safety officer

#### **ASCC**

Army Service Component Command

**ASA(I&E)**

Assistant Secretary of the Army (Installations and Environment)

**ASA(M&RA)**

Assistant Secretary of Army (Manpower and Reserve Affairs)

**bkd**

background

**CAR**

Chief, Army Reserves

**CDE**

committed dose equivalent

**CDRR**

Central Dosimetry Records Repository

**C-E LCMC**

U.S. Army Communications-Electronics Life Cycle Management Command

**CEDE**

committed effective dose equivalent

**CFR**

Code of Federal Regulations

**CFLCC**

Coalition Forces Land Component Command

**CG**

Commanding General

**CHPPM**

U.S. Army Center for Health Promotion and Preventive Medicine

**CIE**

International Commission on Illumination

**CONUS**

continental United States

**CRM**

composite risk management

**CSA**

Chief of Staff Army

**cm**

centimeter

**DA**

Department of the Army

**DAC**

derived air concentration

**DASAF**

Director of Army Safety

**DDE**

deep dose equivalent

**DISA**

Defense Information Systems Agency

**DOD**

Department of Defense

**DODI**

Department of Defense Instruction

**DOE**

Department of Energy

**DOL**

Department of Labor

**DOT**

Department of Transportation

**DPO**

depot property officer

**dpm**

disintegrations per minute

**DRU**

Direct Reporting Unit

**DSN**

Defense Switching Network

**DU**

depleted uranium

**EDE**

effective dose equivalent

**EMR**

electromagnetic radiation

**EPA**

U.S. Environmental Protection Agency

**eV**

electron volt

**FDA**

Food and Drug Administration

**FM**

field manual

**FY**

fiscal year

**GHz**

gigahertz

**GOCO**

Government-owned contractor-operated

**Gy**

gray

**h**

hour

**HAZMAT**

Hazardous Material

**HAHA**

health hazard assessment

**HQ**

Headquarters

**HQDA**

Headquarters, Department of the Army

**Hz**

hertz

**IAEA**

International Atomic Energy Agency

**IATA**

International Air Transport Association

**ICNIRP**

International Commission on Nonionizing Radiation Protection

**IEEE**

Institute of Electrical and Electronics Engineers

**IMCOM**

U.S. Army Installation Management Command

**IMDG**

international maritime dangerous goods

**IMO**

International Maritime Organization

**IR**

infrared

**JCS**

Joint Spectrum Center

**JMC**

Joint Munitions Command

**kBq**

kilobecquerel

**kHz**

kilohertz



**km**

kilometer

**LASER**

light amplification by stimulated emission of radiation

**LSO**

LASER safety officer

**MARSSIM**

Multi-Agency Radiation Survey and Site Investigation Manual

**m**

meter

**μCi**

microcuries

**METT–TC**

mission, enemy, terrain, troops-time available, civilian considerations

**mCi**

millicuries

**mg**

milligram

**MIL–HDBK**

military handbook

**μm**

micrometer

**mm**

millimeter

**MOS**

military occupational specialty

**mrad**

millirad

**mSv**

millisievert

**MTF**

medical treatment facility

**NARM**

naturally occurring or accelerated produced radioactive material

**NAVLAP**

National Voluntary Laboratory Accreditation Program

**NBS**

National Bureau of Standards (now named the National Institute of Standards and Technology)

**NCRP**

National Council on Radiation Protection and Measurements

**NGB**

National Guard Bureau

**NIST**

National Institute of Standards and Technology

**nm**

nanometer

**NMSS**

Nuclear Material Safety and Safeguards

**NORM**

naturally occurring radioactive material

**NRC**

U.S. Nuclear Regulatory Commission

**NSN**

national stock number

**NUREG**

U.S. Nuclear Regulatory Commission Regulation

**NVLAP**

National Voluntary Laboratory Accreditation Program

**OCAR**

Office of the Chief Army Reserve

**OCONUS**

outside continental United States

**OSHA**

Occupational Safety and Health Administration

**OTSG**

Office of The Surgeon General

**PBUSE**

property book unit supply enhanced

**PHz**

petahertz

**PPE**

personal protective equipment

**RAM**

radioactive material

**RATTS**

Radiation Testing and Tracking System

**RDTE**

research, development, testing, and evaluation

**RF**

radio frequency

**RMMF**

radioactive material movement form

**RSC**

Radiation Safety Committee

**RFSO**

radio frequency safety officer

**RSO**

radiation safety officer

**RSSO**

radiation safety staff officer

**SB**

supply bulletin

**SDE**

shallow dose equivalent

**SI**

Systemé Internationale (International System)

**SCIC**

special control item code

**SOFA**

status of forces agreement

**SOP**

standing operating procedure

**SSI**

specialty skill identifier

**Sv**

sievert

**TACOM LCMC**

U.S. Army Tank-automotive and Armaments Command Life Cycle Management Command

**TB**

technical bulletin

**TB MED**

technical bulletin (medical)

**TDA**

table of distribution and allowances

**TEDE**

total effective dose equivalent

**THz**

terahertz

**TLV**

threshold limit values

**TM**

technical manual

**TMDE**

test, measurement, and diagnostic equipment

**TOE**

table of organization and equipment

**TRADOC**

U.S. Army Training and Doctrine Command

**TSG**

The Surgeon General

**USACHPPM**

U.S. Army Center for Health Promotion and Preventive Medicine

**USATA**

U.S. Army Test, Measurement and Diagnostic Equipment Activity

**USC**

United States Code

**USAR**

U.S. Army Reserve

**UV**

ultraviolet

**Section II****Terms****Absorbed dose**

The energy absorbed from the incident radiation per unit mass of absorbing material. The units of absorbed dose are the rad and the gray (Gy).

**Administrative dose**

The dose that a radiation safety officer assigns when dosimetry is inaccurate or has been misused or lost.

**Agreement state**

Any State with which the Atomic Energy Commission or the NRC has entered into an effective agreement in which the State assumes many of the NRC's functions.

**ALARA**

Acronym for "as low as is reasonably achievable" means making every reasonable effort to maintain exposures to radiation as far below applicable dose limits as is practically consistent with the purpose for which the activity is undertaken, taking into account the state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations and in relation to utilization of nuclear energy, radioactive materials, and ionizing radiation in the public interest.

**Annual limit of intake**

The derived limit for the amount of radioactive material taken into the body of an adult worker by inhalation or ingestion in a year. Annual limit of intake (ALI) is the smaller value of intake of a given radionuclide in a year that would result in a committed effective dose equivalent of 5 rems (0.05 Sv) or a committed dose equivalent of 50 rems (0.5 Sv) to any organ or tissue.

**Army Command**

An Army force, designated by the Secretary of the Army, performing multiple Army Service Title 10 functions across

multiple disciplines. Command responsibilities are those established by the Secretary. The Army Commands are U.S. Army Force Command (FORSCOM), TRADOC, and AMC.

**Army National Guard facilities**

Pertains to those facilities normally employed for the administration and training of Army National Guard units, in any entire structure or part thereof, including any interest in land, armories, and storage and other use areas.

**Army regulation**

A directive that sets forth missions, responsibilities, and policies, and establishes procedures to ensure uniform compliance with those policies.

**Army Reserve facilities**

Pertains to those facilities normally employed for the administration and training of Army Reserve units, in any entire structure or part thereof, including any interest in land, Army Reserve Center, and storage and other use areas.

**Army Service Component Command**

The ASCC is the Army component of a Combatant Command. For example, Third United States Army is the USARCENT CFLCC of the United States Central Command.

**Background radiation**

Radiation from cosmic sources; naturally occurring radioactive material, including radon (except as a decay product of source or special nuclear material, or when workplace radon levels require compliance with 29 CFR 1910.1096); and global fallout as it exists in the environment from the testing of nuclear explosive devices or from past nuclear accidents such as Chernobyl that contribute to background radiation. Background radiation does not include radiation from source, byproduct, or special nuclear materials that the NRC regulates or from NARM that the Army regulates.

**Becquerel (Bq)**

The SI unit of radioactivity equivalent to one nuclear transformation per second.

**Bioassay (radiobioassay)**

The determination of kinds, quantities or concentrations, and, in some cases, the locations of radioactive material in the human body, whether by direct measurement (in vivo counting) or by analysis and evaluation of materials excreted or removed from the human body (in vitro counting).

**Byproduct material**

Any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material.

**Committed dose equivalent**

The dose equivalent to organs or tissue of reference that will be received from an intake of radioactive material by an individual during the 50-year period following the intake.

**Committed effective dose equivalent**

The sum of the products of the weighting factors applicable to each of the body organs or tissues that are irradiated and the committed dose equivalent to these organs or tissues.

**Commodity, radioactive**

See radioactive commodity.

**Composite risk management process**

A continuous process applied across the full spectrum of Army training and operations, individual and collective day-to-day activities and events, and base operations functions to identify and assess hazards, develop and implement controls, and evaluate outcomes.

**Condition**

The status of personnel and equipment (readiness) as they interact with the operational environment during mission planning and execution.

**Control**

Action taken to eliminate hazards or reduce their risk.

**Curie (Ci)**

A unit of radioactivity equal to 37 billion becquerels.

**Declared pregnant woman**

A woman who has voluntarily informed her employer, in writing, of her pregnancy and the estimated date of conception, for the purpose of radiation protection of the developing fetus.

**Decommission**

To remove (as a facility) safely from service and reduce residual radioactivity to a level that permits release of the property for unrestricted use and termination of the NRC license, Army reactor permit, or Army radiation authorization.

**Deep-dose equivalent**

Applies to external whole-body exposure and is the dose equivalent at a tissue depth of 1 centimeter (1000 mg/cm<sup>2</sup>).

**Derived air concentration**

The concentration of a given radionuclide in air that, if breathed for a working year of 2,000 hours under conditions of light work (inhalation rate 1.2 cubic meters of air per hour), results in an inhalation of one ALI.

**Deviation**

A departure from the requirements of this pamphlet.

**Dose equivalent**

The product of absorbed dose in tissue, quality factor and all other necessary modifying factors at the location of interest in tissue. The units of dose equivalent are the rem and sievert (Sv).

**Effective dose equivalent**

The sum of the products of the dose equivalent to the organ or tissue and the weighting factors applicable to each of the body organs or tissues that are irradiated. The units of dose equivalent are the rem and sievert (Sv).

**Electromagnetic radiation**

Electric and magnetic fields that oscillate at right angles to each other and to their direction of propagation and that travel at the speed of light in a vacuum (300,000 kilometers per second). Electromagnetic radiation includes gamma rays, x rays, ultraviolet radiation, visible light, infrared radiation, RF radiation, and extremely low frequency electromagnetic radiation (see table 5–3).

**Electron volt (eV)**

A unit of energy equal to  $1.6 \times 10^{-19}$  joule.

**Exposure**

In CRM, the frequency and length of time subjected to a hazard.

**Extremely low frequency electromagnetic radiation**

Electromagnetic radiation with a frequency less than 3 kHz.

**Eye dose equivalent**

Applies to the external exposure of the lens of the eye and is taken as the dose equivalent at a tissue depth of 0.3 centimeter (300 mg/cm<sup>2</sup>).

**Garrison**

The garrison is a table of distribution allowance (TDA) organization that operates the installation and provides base operations services to tenant organizations. The garrison normally belongs to the IMCOM.

**Giga- (G)**

An SI unit prefix indicating a factor of one billion ( $1 \times 10^9$ ).

**Gray (Gy)**

The SI unit of absorbed dose. One gray is equal to an absorbed dose of 1 joule/kilogram (100 rads).

**Hazard**

Any real or potential condition that can cause injury, illness, death of personnel, damage to or loss of equipment or property, or mission degradation.

**Hertz (Hz)**

The SI unit of frequency equivalent to one vibration (cycle) per second.

**High radiation area**

An area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 100 mrem (1 mSv) in 1 hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates.

**Infrared (IR) electromagnetic radiation**

Electromagnetic radiation with a wavelength between 760–780 nm and 1 mm.

**Installation**

An aggregation of contiguous or near contiguous, common mission-supporting real property holdings under the jurisdiction of DOD or a state, the District of Columbia, territory, commonwealth, or possession, controlled by and at which an Army unit or activity (active, USAR, or ARNG) is permanently assigned.

**Ionizing radiation**

Charged subatomic particles and ionized atoms with kinetic energies greater than 12.4 eV, electromagnetic radiation with photon energies greater than 12.4 eV, and all free neutrons and other uncharged subatomic particles (except neutrinos and antineutrinos).

**Kilo- (k)**

SI units prefix indicating a factor of 1000.

**LASER**

A LASER is a device that produces an intense, coherent, directional beam of light by stimulating electronic or molecular transitions to higher energy levels. It is an acronym for Light Amplification by Stimulated Emission of Radiation (LASER). LASERs are classified by degree of potential hazard (see 21 CFR 1040.10 and ANSI Z136.1 for comprehensive definitions of LASER hazard classes).

*a.* Class 1 LASERs emit at levels that are not hazardous under any viewing or maintenance conditions. They are exempt from control measures. (However, as a matter of good safety practices avoid intrabeam viewing in case the LASER is mislabeled.)

*b.* Class 2 LASERs (low-power) emit in the visible light portion of the electromagnetic spectrum. They are a potential eye hazard only for prolonged intrabeam viewing. Eye protection is normally afforded by the aversion response including the blink reflex.

*c.* Class 3 (medium-power) LASERs emit in the infrared, visible, or ultraviolet portions of the electromagnetic spectrum. They are a hazard for direct intrabeam and specular reflection viewing. Diffuse reflection is not normally a hazard.

(1) Class 3a LASERs, even though they emit at Class 3 power levels, have special beam characteristics that make them eye-safe except when viewed through magnifying optics.

(2) Class 3b LASERs are all other Class 3 LASERs. Class 3b LASER devices are potentially hazardous if the unprotected eye views the direct or specularly reflected beam, but they normally do not cause hazardous diffuse reflections.

*d.* Class 4 (high-power) LASERs emit in the infrared, visible, or ultraviolet portions of the electromagnetic spectrum. They are hazardous for direct intrabeam exposure and sometimes diffuse reflection exposure to the eyes or skin. They may also produce fire, material damage, LASER generated air contaminants, and hazardous plasma radiation.

**Low-level radioactive waste**

See Radioactive waste, low-level.

**Materiel subordinate command**

A major subordinate command of the AMC responsible for National Inventory Control Point and National Maintenance Point functions for assigned items (see AR 725–50).

**Member of the public**

Any individual except when that individual is receiving an occupational dose.

**Micro-(μ)**

SI units prefix indicating a factor of one one-millionth ( $1 \times 10^6$ ).

**Military-exempt LASERs**

Those LASERs and LASER systems that the U.S. Food and Drug Administration has exempted from the provisions of 21 CFR 1040.10 and 1040.11 and of 21 CFR 1002 (except 21 CFR 1002.20) (exemption no. 76-EL-01 DOD). These LASER products are used exclusively by DOD components and are designed for actual combat or combat training operations or are classified in the interest of national security.

**Milli- (m)**

SI units prefix indicating a factor of one one-thousandth (0.001).

**Naturally occurring or accelerator produced radioactive material (NARM)**

Radioactive material not classified as byproduct, special, or source material; NARM includes naturally occurring RAM (NORM).

**Nonionizing radiation**

Electromagnetic radiation with photon energies less than 12.4 eV.

**Occupational dose**

The dose received by an individual in the course of employment in which the individual's assigned duties involve exposure to radiation or to radioactive material from regulated and unregulated sources of radiation, whether in the possession of the employer or other person. Occupational dose does not include dose received from background radiation; from any medical administration the individual has received; from exposure to patients administered radioactive material and released in accordance with applicable regulations; from voluntary participation in medical research programs; or as a member of the public. Workplace exposure to naturally-occurring radioactive material, such as radon, considered background radiation by NRC may be considered an occupational exposure by OSHA and regulated under 29 CFR 1910.1096.

**Optical radiation**

See Visible light.

**Peta- (P)**

An SI unit prefix indicating a factor of one million billion ( $1 \times 10^{15}$ ).

**Probability**

The likelihood that an event will occur.

**Qualified expert**

A person who, by virtue of training and experience, can provide competent authoritative guidance on certain aspects of radiation safety. Being a qualified expert in one aspect of radiation safety does not necessarily mean that a person is a qualified expert in a different aspect. Forward requests for determination of whether a certain individual is a qualified expert through command channels to the Army Headquarters (ACOM, ASCC, DRU)/IMCOM RSSO as necessary. Forward these requests to the Director of Army Safety, ATTN: DASAF, 223 23rd St., Room 980, Arlington, VA 22202, for further evaluation as necessary.

**Quality factor**

The modifying factor (listed in 10 CFR 20.1004, tables 1004(b).1 and 1004(b).2) that is used to derive dose equivalent from absorbed dose.

**Rad**

A unit of absorbed dose. One rad is equal to an absorbed dose of 0.01 joule/kilogram (0.01 gray).

**Radiation**

For the purposes of this pamphlet, unless otherwise specified, radiation includes both ionizing and nonionizing radiation.



**Radiation area**

An area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 0.005 rem (0.05 mSv) in 1 hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates.

**Radiation safety**

For the purposes of this pamphlet, a scientific discipline whose objective is the protection of people and the environment from unnecessary exposure to radiation. Radiation safety is concerned with understanding, evaluating, and controlling the risks from radiation exposure relative to the benefits derived. Same as “health physics” and “radiation protection.”

**Radiation Safety Committee**

An advisory committee for the commander/director to assess the adequacy of the command’s Radiation Safety Program. Same as “radiation control committee” and “radiation protection committee.”

**Radiation safety officer**

The person that the commander designates, in writing, as the executive agent for the command’s Radiation Safety Program (same as “radiation protection officer”). These individuals are provided training commensurate with the radiation hazards they manage. Types of RSOs discussed in this pamphlet include:

- a. Garrison RSO.* The RSO on the staff of the garrison commander. The Garrison RSO normally belongs to the IMCOM) (For ARNG, the state RSO is considered to be the Garrison RSO).
- b. Installation RSO.* The RSO on the staff of the installation commander for arsenals, depots, and similar areas not managed by the IMCOM.
- c. Mission RSO.* The RSO in an “Army Headquarters” activity. The Army Headquarters activity is typically a tenant organization on an installation (synonymous with tenant activity RSO).
- d. Unit RSO* The RSO in an Army unit (typically a brigade, battalion, company, detachment or TDA organization).

**Radiation Safety Program**

A program to implement the objective of radiation safety. The Army’s Radiation Safety Program includes all aspects of—

- a.* Measurement and evaluation of radiation and radioactive material pertaining to protection of personnel and the environment.
- b.* Army compliance with Federal and DOD, and Army radiation safety regulations.
- c.* The Army’s radiation dosimetry, radiation bioassay, radioactive waste disposal, radiation safety training, and radiation instrument test, measurement, and diagnostic equipment (TMDE) and calibration programs.

**Radioactive commodity**

An item of Government property made up in whole or in part of radioactive material to which an NSN or part number is assigned.

**Radioactive waste**

Solid, liquid, or gaseous material that contains radionuclides regulated under the Atomic Energy Act, as amended, or is of sufficient quantity to require an Army radiation authorization, and is of negligible economic value considering the cost of recovery.

**Radioactive waste, low-level**

Material the NRC classifies as low-level radioactive waste (see 10 CFR 62.2); waste not classified as high-level radioactive waste (spent nuclear fuel), as transuranic waste, or as uranium or thorium tailings and waste; material acceptable for burial in a land disposal facility (see 10 CFR 61).

**Radiobioassay**

See bioassay.

**Radio frequency electromagnetic radiation**

Electromagnetic radiation with frequencies between 3 kHz and 300 GHz.

**Radio frequency controlled environment**

Locations where RF exposure may be incurred by persons who are aware of the potential for occupational exposure, by other cognizant persons, or as the incidental result of transient passage through areas where analysis shows the exposure levels may be above those shown in DODI 6055.1, table 6–2–1, but do not exceed those shown in DODI

6055.1, table 6–1–1. Existing physical arrangements or areas, such as fences, perimeters, or weather deck(s) of a ship may be used in establishing a controlled environment.

### **Radio frequency uncontrolled environments**

Locations where RF exposures do not exceed permissible exposure levels in DODI 6055.1, table 6–2–1. Such locations generally represent living quarters, workplaces, or public access areas where personnel would not expect to encounter higher levels of RF energy.

### **Radiation Safety Committee recorder**

The person directly responsible for the accuracy and completeness of the RSC minutes. The recorder may designate someone else to take notes at RSC meetings (for example, an assistant or secretary). The recorder will be the RSO to help ensure that the minutes meet regulatory requirements.

### **Rem**

A unit of any of the quantities expressed as dose equivalent. The dose equivalent in rems is equal to the absorbed dose in rads multiplied by the quality factor (1 rem=0.01 sievert).

### **Residual Risk**

The levels of risk remaining after controls have been identified and countermeasures have been selected for hazards that may result in loss of combat power. Controls are identified and selected until residual risk is at an acceptable level or until it cannot be practically reduced any further.

### **Restricted Area**

An area, access to which is limited by the RSO for the purpose of protecting individuals against undue risks from exposure to radiation and radioactive materials. Restricted area does not include areas used as residential quarters, but separate rooms in a residential building may be set apart as a restricted area.

### **Risk**

A measure of the expected loss from a given hazard or group of hazards; the probability of exposure to chance of injury or loss from a hazard. Risk level is expressed in terms of hazard probability and severity.

### **Risk assessment**

Steps 1 and 2 of the Army's CRM Process, identification and assessment of potential loss in terms of hazards. An identified hazard is assessed to determine the risk (both the probability and severity) of an incident due to the presence of the hazard.

*a.* Hazard severity. An assessment of the expected consequence, defined by degree of injury or occupational illness, property damage or effect on the mission that could occur from a hazard. A hazard is coded by an uppercase Roman numeral according to criteria contained in FM 5–19.

*b.* Accident probability. An assessment of the likelihood that, given exposure to a hazard, an accident will result. Accident probability is coded by an uppercase letter according to criteria contained in FM 5–19.

### **Risk acceptance**

The decision to accept or not accept the risk(s) associated with an action; made by the commander, leader, or individual responsible for performing that action and having the appropriate resources to control or eliminate the risk's associated hazard.

### **Risk management integration**

The embedding of risk management principles and practices into Army operations, culture, organizations, systems, and individual behavior.

### **Severity**

The expected consequence of an event (hazardous incident) in terms of degree of injury, property damage, or other mission impairing factors (loss of combat power and so on) that could occur.

### **Shallow dose equivalent**

Applies to the external exposure of the skin or an extremity and is taken as the dose equivalent at a tissue depth of 0.007 centimeter (7 mg/cm<sup>2</sup>) averaged over an area of 1 square centimeter.

**Short course**

For the purpose of this pamphlet, a course of three weeks duration or less based on the training developers determination of the precise length of courses.

**Sievert (Sv)**

The SI unit of any of the quantities expressed as dose equivalent. The dose equivalent in sieverts is equal to the absorbed dose in grays multiplied by the quality factor (1 Sv=100 rem).

**Source material**

Uranium or thorium, or any combination thereof, in any physical or chemical form or ores that contain by weight one-twentieth of one percent (0.05%) or more of uranium, thorium, or any combination thereof. Source material does not include special nuclear material.

**Special nuclear material**

Plutonium, uranium-233, uranium enriched in the isotope 233 or in the isotope 235, or any material artificially enriched by any of the foregoing.

**Tera- (T)**

An SI unit prefix indicating a factor of one trillion ( $1 \times 10^{12}$ ).

**Total effective dose equivalent**

The sum of the deep-dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures).

**Type classification**

A designation the Army uses to indicate acceptability for service use.

**Ultraviolet (UV) electromagnetic radiation**

Electromagnetic radiation with wavelengths between 100 nm and 380–400 nm.

**Unrestricted area**

An area, access to which is neither limited nor controlled (for the purposes of ionizing radiation safety).

**Very high radiation area**

An area, accessible to individuals, in which radiation levels could result in an individual receiving an absorbed dose in excess of 500 rads (5 Gy) in 1 hour at 1 meter from a radiation source or from any surface that the radiation penetrates.

**Visible light**

Electromagnetic radiation with wavelengths between 380–400 nm and 760–780 nm.

**Weighting factor**

For an organ or tissue, the proportion of the risk of stochastic effects resulting from irradiation of that organ or tissue to the total risk of stochastic effects when the whole body is irradiated uniformly.

**Section III****Special Abbreviations and Terms**

This section contains no entries.

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